



**DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
INSTALLATIONS AND ENVIRONMENT
110 ARMY PENTAGON
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REPLY TO
ATTENTION OF

MEMORANDUM THRU DIRECTOR OF THE ARMY STAFF

FOR DISTRIBUTION

**SUBJECT: Interim Guidance on Nerve and Mustard Agent Decontamination and
Medical Services in Industrial Activities**

The enclosed interim guidance provides requirements and procedures for safer, more effective chemical agent decontamination and medical treatment. This guidance is applicable to Army industrial (i.e., chemical agent stockpile, recovery, disposal, demilitarization, and research, development, test and evaluation), but not to warfighting, activities. Army chemical agent stockpile, recovery, disposal, demilitarization, and research, development, test and evaluation activities will begin implementing these procedures immediately, with full compliance by October 1, 2003. Applicable Army regulations and pamphlets will be updated to reflect incorporate this guidance.

This guidance has been coordinated with the Office of the Surgeon General. My point of contact for this issue is Mr. Jim Patton, 703/697-3123.


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(Environment, Safety and Occupational Health)
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Enclosures

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Interim Guidance on Nerve Agent Decontamination and Medical Services in the Industrial Setting

Section 1 – Information and Recordkeeping.

1-1. Information and reporting requirements

a. The installation commander or chemical activity commander, in coordination with other appropriate personnel, provides the following information to the competent medical authority (CMA):

- (1) A copy of this pamphlet.
- (2) A written description of the affected individual's duties as they relate to the nerve agent exposure potential in routine or emergency operations.
- (3) The air-monitoring results of an individual's potential exposure, measured or estimated, under the circumstances defined in Section 5.

(4) A description of any personal protective equipment (PPE) used or to be used.

b. If an individual is removed from work because of signs and symptoms commonly associated with exposure to nerve agents or if the CMA believes that a potential exposure evaluation provides clinical or biochemical evidence of a nerve agent exposure effect, the occurrence should be—

(1) Immediately reported to the installation commander, chemical activity commander, or site project manager or his or her designated representative.

(2) Reported by CMA to the certifying official (if a chemical surety related event, see AR 50-6) as potentially disqualifying information.

(3) Documented in the medical record.

(4) Reported through the Reportable Medical Events System as soon as possible after the diagnosis has been made or within 48 hours (applicable to government-operated U.S. Army Medical Department clinics and hospitals only). For information on reporting requirements and procedures, see <http://www.amsa.army.mil>

1-2. Record keeping

a. General. The occupational health medical surveillance program as described in AR 40-5 is composed of both general medical and workplace surveillance and job-specific surveillance. The job-specific surveillance is based on the physical requirements and exposure risks of specific jobs. The nerve agent medical surveillance program is a job-specific surveillance program and is a part of the overall occupational and environmental health program. The CMA shall maintain the medical records of personnel enrolled in the nerve agent medical surveillance program in accordance with the requirements of AR 40-66, AR 40-5, and 29 CFR 1910.1020. The medical record should include the results of post-offer, pre-placement; periodic job-related; and termination examinations (see Sections 2 and 3 and Appendix), as well as respirator screenings/clearances and the results of any nerve agent exposure or potential exposure evaluations. Civilian medical records (x-rays) must be maintained for 40 years or the duration of the individual's employment plus 30 years, whichever is longer. (See AR 40-66, para 7-10a). The remainder of the medical record must be retained for the duration of employment plus 30 years (29 CFR 1910.1020 (d) (1) (i)).

b. Air-monitoring records. Documentation of a worker's exposure potential to nerve agents is important in assessing the present and past exposure history and in documenting compliance with the established airborne exposure limit (AEL).

(1) The installation commander or chemical activity commander will designate qualified personnel to maintain, interpret, correlate, and transmit air monitoring records. (See DA Pam 385-61, para 3-7a through c.)

(2) The CMA incorporates atmospheric monitoring data on exposed workers or potentially exposed workers (see glossary) into the medical record on Standard Form (SF) 600 (Medical Record – Chronological Record of Medical Care), DA Form 4700 (Medical Record - Supplemental Medical Data), or other appropriate forms. (See Section 5 for criteria for potential exposure.) Any medical record entry of exposure or potential exposure above prescribed Worker Exposure Limit (WPLs), Short-Term Exposure Limits (STELs), or Immediately Dangerous to Life or Health (IDLH) values shall include—

(a) The date, location, and results of each air sample taken, and whether confirmation of the results was obtained through a second analytical method of detection.

(b) The physical state of the nerve agent, potential route of exposure, time of occurrence, estimated duration of exposure or potential exposure, and type of PPE worn. An example of a medical data sheet that can be used to collect such information is provided in Appendix, Section II.

c. Employee access. The CMA—

(1) Provides the affected individuals, former employees, or their designated representatives access to the air-monitoring records associated with exposure or potential exposure evaluations. (See DA Pam 385-61, para 3-7d.)

(2) Makes available the medical records containing the examination content described in paragraph 1-1a for inspection and copying per AR 40-66, AR 50-6, and 29 CFR 1910.1020.

1-3. Employee health education

a. Employee health training. The CMA reviews and concurs or non-concurs with all employee-training materials, standing operating procedures, or plans dealing with issues such as contamination avoidance, personal protection, decontamination procedures, buddy-aid, self-aid, and essential first aid practices.

b. Access to health education materials. The CMA coordinates with the installation commander, chemical activity commander, or site project manager to ensure that a copy of all health education materials used in the health education program or training are readily available to all individuals with the potential for exposure.

c. Hazard communication information. Methods of instruction may include formal classes, work area meetings, audiovisual and computer-based presentations as appropriate. As a minimum, the installation commander, chemical activity commander, or site project manager shall annually repeat health-related training as described below.

(1) The installation commander, chemical activity commander, or site project manager, with technical assistance from the CMA, shall, through a written hazard communication program, define the mechanisms for training workers about the exposure potential to nerve agents and the protective measures necessary for the job.

(2) The following nerve agent specific items should be included in the employee hazard communication training—

(a) An explanation of the types of operations in the individual's workplace that have a nerve agent exposure potential.

(b) Methods used by the installation or chemical activity to recognize and evaluate work areas with a nerve agent exposure potential.

(c) An explanation of the potential acute and chronic health effects associated with nerve agent exposure and the purpose and description of the nerve agent medical surveillance program (see Sections 2 and 3 and Appendix).

(d) Protective measures to include administrative and engineering controls, PPE, safe work practices, and emergency procedures to include self-aid, buddy-aid, first aid, and decontamination.

(e) An explanation of the nerve agent material safety data sheets (MSDSs) and applicable standing operating procedures to assure that nerve agent materials are handled and stored per standing operating procedures and DA regulations.

(f) Emergency evacuation and notification procedures.

(3) The CMA shall provide technical assistance, monitor selected training sessions, and approve, in writing, the program of instruction and lesson plans.

(4) The installation commander, chemical activity commander, or site project manager documents hazard communication training, in writing, to include the signature of both the trainee and the approving authority as well as the date of the training. Document training for all DA employees on Department of Defense (DD) Form 1556 (Request, Authorization, Agreement and Certification of Training and Reimbursement) or other appropriate forms, and incorporate this documentation permanently in the employee's official personnel folder.

1-4. Material safety data sheets

a. The employee must have direct access to the MSDS' content and location. The MSDS are products of the material developer. To obtain copies of the current MSDS, contact the U.S. Army Soldier, Biological Chemical Command, ATTN: AMSSB-RCB-RS (Safety Office), Building 3330, Aberdeen Proving Ground, MD 21010-5423.

b. Since the MSDS' content may change with time, the MSDS may not always represent the medical guidance provided by the Office of The Surgeon General. Questions concerning medical guidance provided in the MSDS may be addressed to HQDA (DASG-PPM-NC), 5109 Leesburg Pike, Falls Church, VA 22041-3258.

c. The MSDSs must be available in an organized manner where the needed information can be retrieved by employees in an emergency situation.

Section 2 - Nerve Agent Medical Surveillance Program.

2-1. Introduction

a. The nerve agent medical surveillance program is part of a comprehensive occupational and environmental health program that preserves health and prevents work-related disease. Medical surveillance may be defined as the ongoing, systematic, evaluation of employees at risk of exposure to achieve early recognition and prevention of clinical disease. The nerve agent medical surveillance program is part of a larger hazard-specific medical surveillance program, which includes other chemical, physical, and biological hazards that have been included by the industrial hygienist on a current inventory of OH hazards. When conducting a nerve agent medical surveillance examination, the CMA should also consult the health hazard inventory or

industrial hygienist to determine what (if any) other exposures have occurred (or are likely to occur) at or above the action levels established for each chemical or physical hazard. Based on this information, the CMA determines the appropriate medical surveillance questions or test and examination elements for those exposure hazards.

b. The CMA establishes the nerve agent medical surveillance program for personnel with a significant exposure potential to nerve agents (see Section 3) and assures that employees assigned to one of four medical surveillance categories (A, B, C, or D) by the certifying officials have been enrolled in the nerve agent medical surveillance program. Personnel with a high risk of nerve agent exposure (that is, Category A) will receive the most extensive examinations and the most frequent red-blood cell cholinesterase (RBC-ChE) monitoring. Table 2-1 presents the nerve agent category-specific medical surveillance requirements.

c. Section 4 provides the information on the diagnosis and treatment of nerve agent intoxication.

2-2. Nerve agent medical surveillance categories

The installation certifying official recommends medical surveillance category assignments for all personnel with a nerve agent exposure potential to the CMA, based upon the employees' activities in nerve agent operating areas. This assignment can be found on the chemical duty position roster.

a. Category A includes personnel—

(1) With a high nerve agent exposure potential due to the nature of the agent operations being conducted.

(2) Who may be routinely required (that is, on the average, once a week or four times per month) to make entries or to work for prolonged periods in areas with high concentrations of nerve agent (that is, greater than the IDLH values). These areas also require the use of a self-contained breathing apparatus or a combination airline respirator with an auxiliary self-contained air supply, along with the appropriate dermal protective ensemble. Areas with an unknown agent concentration value will be considered IDLH until monitoring proves different.

b. Category B includes personnel with—

(1) A lower nerve agent exposure potential. These individuals are infrequently required (that is, less than once a week) to make entries or to work for prolonged periods in areas with high concentrations of nerve agents (that is, above IDLH values), but may have periodic activities that require work in nerve agent concentrations between the WPLs and IDLH values. Examples of such activities might include (but are not limited to)—

(a) Hotline or decontamination activities. (See DA Pam 385-61.)

(b) Air-monitoring technician or 3X-monitoring activities.

(c) Maintenance or surveillance operations conducted in nerve agent storage or disposal facilities.

(d) Demilitarization protective ensemble (DPE) stand-by activities.

(e) Chemical accident/incident response by initial response force members.

(2) Job requirements involving the wearing of air-purifying or atmosphere-supplying respirators and dermal protective ensembles during nerve agent training, emergency response exercises, or other related duties.

c. Category C includes personnel—

(1) With minimal probability of exposure to nerve agents except under accident conditions, but whose activities may place them periodically in close proximity to nerve agent operating areas.

(2) Who would not be engaged in activities where concentrations of nerve agent would exceed the WPLs and would likely be required to wear respiratory protective equipment only for emergency egress.

(3) Laboratory personnel working with neat toxic chemical agents.

d. Category D includes—

(1) Transient visitors to nerve agent operating areas where there is an extremely limited exposure potential. An example of this visitor would be personnel required to observe, review or inspect activities within a chemical limited area or chemical exclusion area (in storage or disposal facilities) where the use of engineering controls does not completely preclude the risk of accidental exposure. (NOTE: Casual visitors receiving familiarization or orientation tours through facilities where nerve agent operations are not ongoing or where exposures have been precluded by engineering controls NEED NOT be assigned to category D.)

(2) Laboratory personnel working with research, development, test and evaluation dilute solutions of nerve agents.

2-3. Medical surveillance examinations

Four examinations may be conducted as part of the nerve agent medical surveillance program. These include post-offer, pre-placement; periodic job-related; termination, and potential exposure evaluations.

2-4. Post-offer, pre-placement examinations

a. All personnel assigned to work in areas with a nerve agent exposure potential shall receive a post-offer, pre-placement medical surveillance examination to—

(1) Document that the employee—

(a) Does not exhibit physical, mental, or emotional impairments that may result in a higher vulnerability to nerve agent exposure.

(b) Is physically and mentally able to wear and use the required PPE.

(2) Establish the employee's baseline health status, particularly for organ systems that may be affected by exposure to nerve agents.

(3) Assess the employee's functional capacity to perform specific work-related tasks.

(4) Identify any medical conditions for which recommended work restrictions, limitations, or reasonable accommodations are appropriate under the provisions of 29 CFR Part 1630.

b. This examination should be performed by or under the supervision of the CMA and at no cost to the employee. See Section 3 for the examination requirements by medical surveillance category.

c. An acceptable post offer, pre-placement examination is any medical examination that is--

(1) Conducted within 90 days prior to work assignment to an area involving the potential exposure to nerve agents. If this examination was not conducted specifically as a post offer, pre-placement examination, the CMA should review the examination results and render a written opinion in the medical record as to its acceptability as a post offer, pre-placement examination.

(2) Consistent with the requirements outlined in paragraphs 3-1 through 3-4. If the examination does not include all of the requirements, the CMA should perform the procedures that were omitted.

2-5. Periodic job-related examinations

a. The installation commander or chemical activity commander assures that all personnel assigned to work in areas with an exposure potential to nerve agents receive the appropriate periodic job-related examinations to include RBC-ChE monitoring. Paragraphs 3-5 through 3-8 detail the periodic examination requirements by medical surveillance category. The CMA performs the appropriate category-specific, periodic examination and informs the certifying official of those individuals who do not have current periodic examinations.

b. Periodic job-related examinations are—

(1) Usually performed on an annual basis.

(2) Conducted to document any change in the employee's health status, particularly with respect to specific exposure hazards encountered in the workplace over the intervening year.

(3) Designed to screen for nerve agent exposure effects and to assess the employee's physical capacity to perform essential job functions. Using the data gathered from these examinations, the CMA may discover correlations between workplace exposures to nerve agents and specific health endpoints by comparing the employee to—

(a) Himself or herself over time.

(b) Groups of workers with greater or lesser degrees of exposure.

2-6. Termination examinations

a. The CMA performs a termination examination on individuals within 30 days before or after removal from the nerve agent medical surveillance program. The examination documents the employee's health status at the time of termination, particularly for organ systems that may have been affected by nerve agent exposure. Paragraphs 3-9 through 3-11 detail the termination examination requirements by medical surveillance category.

b. Termination examinations do not have to be conducted on individuals who have been enrolled in the nerve agent medical surveillance program for three months or less, unless—

(1) There is documented evidence of exposure to nerve agents (that is, clinical signs or symptoms consistent with a nerve agent exposure effect)

(2) A potential exposure evaluation has been conducted within the three-month time period.

c. The installation commander or chemical activity commander ensures that a termination examination (to include RBC-ChE determination) has been administered or offered to workers who—

(1) Have been enrolled in the nerve agent medical surveillance program for more than three months.

(2) Have been permanently disqualified or administratively terminated from the chemical personnel reliability program (PRP) and who no longer have nerve agent exposure potential. (See AR 50-6, paragraph 2-21.)

2-7. Post exposure and potential exposure evaluations

This pamphlet requires medical evaluations be performed in the event of accidental exposure or potential exposure to nerve agents. In the past, the criteria used to identify potential exposures have varied between chemical weapon storage and disposal sites. This variability has led to different implementation criteria for event-driven medical evaluations of these patients.

a. An exposed worker is any individual (working in a nerve-agent operating area) who exhibits clinical signs or symptoms of nerve agent intoxication. In addition, a worker is presumed to have been exposed to nerve agents (even if asymptomatic) if he or she has—

(1) An acute depression in ChE activity (10 percent or greater) from the baseline while working in a nerve-agent operating area.

(2) No immediate history of contact with other ChE-inhibiting substances.

(3) No corresponding reduction in red cell mass.

(4) Urine assays that (see paragraph 3-15e) confirm the presence of phosphonic acid metabolites specific for nerve agents, as described in Technical Bulletin, Medical (TB MED) 296.

b. A potentially exposed worker is an individual who works in a nerve-agent operating area where—

(1) Levels of nerve agent—

(a) Exceed the protective capability of the PPE.

(b) Are detectable at or above the applicable AEL and there is either a breach in the PPE or a failure of engineering controls.

c. If an individual has been accidentally exposed or is potentially exposed, the CMA should—

(1) Obtain information concerning the circumstances of the exposure or potential exposure and provide the appropriate medical examinations (for example, RBC-ChE monitoring) and emergency treatment as needed (see Sections 5 and Appendix, Section II).

(2) Document in the medical record the results of the examination and an opinion as to whether a nerve agent exposure (see glossary) has occurred.

(3) Record any air-monitoring measurements in the medical record (see paragraph 1-2b(2)). See Appendix, Section II, for the content of a nerve agent exposure and potential exposure evaluation.

d. Section 5 provides additional potential exposure evaluation criteria for GB and VX operations.

2-8. Documentation of medical opinion

The CMA records a written opinion in the medical record for each medical examination. This opinion includes—

a. The results of the medical examination and testing.

b. A statement about any detected medical condition that would place the individual's health at an increased risk of impairment if exposed to nerve agents.

c. Any recommended limitations on the potential exposure to nerve agents or on the use of PPE.

d. A statement that the employee has been informed of the above.

2-9. Red blood cell-cholinesterase activity determinations

a. Quality assurance.

(1) The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) Cholinesterase Reference Laboratory manages the external quality assurance and quality control program for RBC-ChE activity determinations in support of the nerve agent medical surveillance program.

(2) All clinics or laboratories performing RBC-ChE activity determinations in support of the nerve agent medical surveillance program must comply fully with the provisions of TB MED

590 and related USACHPPM procedures. Participation in the external quality assurance/quality control program is mandatory.

b. Monitoring RBC-ChE for DOD contractors.

(1) Department of Defense contractors performing work with a nerve agent exposure potential will be enrolled in a nerve agent medical surveillance program and will undergo periodic RBC-ChE monitoring. Under special provisions established by the Secretary of the Army, any participating U.S. Army laboratory may analyze DOD contractors' RBC-ChE assays on a cost reimbursable basis. Alternatively, the contractor may send the blood specimens to the USACHPPM Cholinesterase Reference Laboratory for primary analysis on a cost reimbursable basis. See TB MED 590.

(2) The Cholinesterase Reference Laboratory or site laboratory director will forward the RBC-ChE results to the CMA (or designated representative) for incorporation as part of the nerve agent medical surveillance examination and for placement in the patient's medical record.

(3) The CMA will investigate any ChE depression greater than 10 percent from the baseline (see Section 3) and maintain the RBC-ChE records per paragraph 3-14.

c. Red-blood cell-cholinesterase monitoring. Specific requirements for RBC-ChE monitoring in support of the nerve agent medical surveillance program are provided in paragraphs 3-12 through 3-15.

Table 2-1
Category specific medical surveillance¹

Category	Post-offer, pre-placement	Periodic²	Termination
A	Occupational history Medical history (MH) Physical examination Electrocardiogram (EKG) PPE evaluation Audiometric examination Visual acuity Pupillary reactivity Baseline RBC-ChE	Interval Occ. history Interval MH Physical Exam EKG (every 5 years) PPE evaluation Audiometric examination Visual acuity Pupillary reactivity RBC-ChE ³ (every 3 yrs)	Interval Occ. history Interval MH RBC-ChE
B	Same as category A	Same as category A	Same as category A
C	Occ. history MH Baseline RBC-ChE Respirator questionnaire as required ⁴	Interval Occ history/ MH RBC-ChE ³ (every 3 yrs) Respirator questionnaire as required ⁴	RBC-ChE Interval Occ history/MH Respirator questionnaire as required ⁴
D	Baseline RBC-ChE ⁴ Respirator questionnaire as required ⁴	RBC-ChE ³ Respirator questionnaire as required ⁴	Respirator questionnaire as required ⁴

¹See Section 3 for detailed guidance.

²Denotes annual requirement, unless otherwise mentioned.

³Re-established by a two-sample blood draw at least every three years.

⁴Category C and D employees entering nerve agent operating areas may be issued military respirators or emergency escape devices for emergency egress. Under provisions of 29 CFR 1910.134 all individuals issued respiratory protection must be medically evaluated to ensure that they are physiologically and psychologically able to wear the respirators for the intended tasks. Respirator clearance evaluations should be added to the scope of the nerve agent medical surveillance examination under these circumstances. See Appendix for the Occupational Safety and Health Administration (OSHA) Respirator Questionnaire and Medical Clearance Form.

Section 3 - Medical Surveillance Program for Personnel with a Significant Exposure Potential to Nerve Agents.

3-1. Post-Offer, Pre-Placement Examinations for Categories A and B Personnel

The CMA—

a. Obtains a comprehensive—

(1) Occupational history, with specific emphasis on prior potential exposures to cholinesterase-inhibiting substances (for example, organophosphorous chemicals) and chemicals associated with cardiovascular, pulmonary, neurological, or psychiatric disease.

(2) The MH and review of systems, to include the OSHA Respirator Questionnaire or equivalent (see Appendix), focusing on the skin, eyes, nose/throat, pulmonary, cardiovascular, neurologic and reproductive systems.

b. Administers a general physical examination—

(1) With emphasis on the identification of any work-limiting conditions requiring reasonable accommodations or work restrictions, particularly with regard to having the ability to wear PPE.

(2) To detect any significant abnormalities in visual acuity or hearing or abnormalities of the skin or cardiovascular, pulmonary or neurologic systems, which might make the individual more susceptible to the effects of nerve agents.

c. Performs specific evaluations to include a (an)—

(1) Electrocardiogram at rest. At the discretion of the CMA, an individual may obtain an exercise tolerance test (that is, stress EKG) if the individual is to perform strenuous activities using PPE.

(2) Evaluation of the individual's physical ability to perform work involving potential exposure to nerve agents using the required dermal and respiratory protective ensembles (PPE). This evaluation uses reliable evidence such as history (for example, recent successful completion of a mask confidence exercise) or observations (for example, a use test) that show the individual can safely and effectively use the required PPE and that no physiological or psychological conditions impair the individual's ability to use this equipment. For this evaluation, document this evidence and the written medical opinion of the individual's ability to use such equipment in the individual's medical record.

(a) In addition to reviewing the worker's responses to the OSHA Respirator Questionnaire, the CMA must document baseline pulmonary function tests including, as a minimum, the forced vital capacity and the 1-second forced expiratory volume. (See TB MED 509.) Subsequent evaluations of physiologic capabilities to wear a respirator do not require repeated documentation of pulmonary function studies unless specifically required by the CMA.

Abnormal pulmonary function tests alone are not grounds for disqualification. If there are abnormal pulmonary function tests, consider the following before disqualifying an individual from respiratory PPE use: The individual's MH and age; the nature of the work to be performed while wearing respiratory PPE; the type of respiratory PPE employed; the results of the tests of cardiovascular status; and if necessary, a use test.

(b) The CMA must inform the certifying official, in a confidential manner, about any individual in the chemical PRP who appears to be physically or psychologically unable to wear dermal or respiratory protective ensembles (See AR 50-6, para 2-8e.) If work practices require activities to be performed in full protective clothing (that is, air-purifying or atmosphere-supplying respirators with an encapsulating protective ensemble), document the individual's

ability to withstand heat stress in the medical record and enroll the individual in a heat stress prevention program.

(3) Audiometric examination to determine the individual's auditory acuity per DA PAM 40-501.

(4) Determination of the near and distant visual acuity and pupillary reactivity.

(a) All individuals will have corrected near and distant visual acuity of 20/40 or better in at least one eye. If corrective lenses are required to provide this acuity, order the lenses before the individual's placement in the workplace.

(b) Provide individuals working in eye hazardous areas or jobs with appropriate protective eyewear (see DA PAM 40-506), to include, but not to be limited to, prescription and plano-industrial safety glasses and chemical splash goggles.

(c) Instruct individuals on the importance of wearing eyewear and the proper use of these items (whether protective or merely corrective, including optical inserts for the protective mask (if required)).

(5) Determination of the individual's baseline RBC-ChE activity as required by paragraph 3-12.

3-2. Post-Offer, Pre-Placement Examinations for Category C Personnel

a. No post-offer, pre-placement examination is required; however, the CMA should obtain a comprehensive occupational history with specific emphasis on prior potential exposures to ChE-inhibiting substances.

b. The CMA should also obtain a MH and a review of systems, focusing on the skin and eyes, cardiovascular, pulmonary, neurologic and psychiatric systems.

c. If the individual may be issued a military respirator or emergency escape device for emergency egress, the individual will complete the OSHA Respirator Questionnaire provided in Appendix, and the CMA should render and document a medical opinion as to the individual's ability to safely wear a respirator for emergency egress purposes.

d. The CMA will also obtain a determination of the individual's baseline RBC-ChE activity per paragraph 3-12.

3-3. Post-Offer, Pre-Placement Examinations for Category D Personnel

a. No post-offer, pre-placement examination is necessary. However, if a respirator or emergency-escape device is to be issued to the worker for emergency egress purposes, the individual will complete the OSHA Respirator Questionnaire contained in Appendix.

b. The CMA will obtain a determination of the individual's RBC-ChE baseline per paragraph 3-12. An RBC-ChE baseline does not necessarily have to be established at the installation visited.

c. The CMA will make the determination if the individual is medically fit to carry out assigned duties.

d. Base the need for an RBC-ChE baseline determination on the likelihood, frequency, and level of potential nerve agent exposure. NOTE: Personnel may require a baseline RBC-ChE determination when they are not in the PRP and not on a chemical duty position roster. The installation commander or chemical activity commander should not assume, for example, that all chemical surety inspectors or all foreign diplomats require a baseline, since the risk of exposure may vary greatly from case to case. As general guidance--

(1) Transient visitors who are required to observe, review, or inspect nerve agent operations (where engineering controls do not completely preclude the risk of accidental exposure) should be considered category D personnel. These persons may be permanently assigned to one installation/organization and be temporarily assigned to duty as another station.

(2) Casual visitors who may be receiving familiarization or orientation tours through facilities where nerve agent operations are not ongoing or where exposures are precluded by engineering controls need not be considered Category D personnel.

3-4. Abnormal findings

In the event of abnormal findings on the post-offer, pre-placement examination, the CMA—

- a. Determines what (if any) functional activity or PPE limitations are necessary to protect the health of the worker.
- b. Discusses these with the worker after reviewing the worker's job description.
- c. Informs the worker's supervisor of any work restrictions or reasonable accommodations that might be necessary to protect the health of the worker or to allow him or her to accomplish the essential functions of their job.
- d. Informs the certifying official in a confidential manner of any potentially disqualifying information if the worker is in the chemical PRP, along with the appropriate recommendation for restriction or disqualification. (See AR 50-6, para 2-15a(4).)

3-5. Periodic Job-Related Examinations for Categories A and B Personnel

a. The CMA will obtain a determination of the individual's RBC-ChE baseline per paragraph 3-12. An RBC-ChE baseline does not necessarily have to be established at the installation visited.

b. Base the need for an RBC-ChE baseline determination on the likelihood, frequency, and level of potential nerve agent exposure. NOTE: Personnel may require a baseline RBC-ChE determination when they are not in the PRP and not on a chemical duty position roster. The installation commander or chemical activity commander should not assume, for example, that all chemical surety inspectors or all foreign diplomats require a baseline, since the risk of exposure may vary greatly from case to case. As general guidance—

(1) Transient visitors who are required to observe, review, or inspect nerve agent operations (where engineering controls do not completely preclude the risk of accidental exposure) should be considered category D personnel.

(2) Casual visitors who may be receiving familiarization or orientation tours through facilities where nerve agent operations are not ongoing or where exposures are precluded by engineering controls need not be considered Category D personnel.

(3) The tests in Table 2-1 should supplement other hazard-specific medical surveillance tests indicated by worker exposures (if any) to substances other than nerve agent that are listed on the health hazard inventory. (See AR 40-5, para 5-9a.)

3-6. Periodic Job-Related Examinations for Category C Personnel

For workers designated in Category C, the CMA will take an interval work history, MH and review of systems, focusing on any signs, symptoms, or adverse effects that may be connected to exposure to nerve agents or other ChE-inhibiting substances. A periodic/annual job-related examination is not necessary. Instruct individuals who continue to wear respirators for emergency egress purposes to complete the OSHA Respirator Questionnaire (see Appendix).

The CMA should also obtain a determination of RBC-ChE activity. The nerve agent examination's content should supplement other hazard-specific medical surveillance tests indicated by worker exposures (if any) to substances other than nerve agent that are listed on the health hazard inventory (see AR 40-5, para 5-9a).

3-7. Periodic Job-Related Examinations for Category D Personnel

A periodic job-related examination is not required, however an examination is recommended every three years. If a respirator clearance is required, the individual should complete the OSHA Respirator Clearance Form contained in Appendix. The CMA should also maintain a current baseline RBC-ChE.

3-8. Periodic Job-Related Examinations - Abnormal findings

In the event of abnormal findings on the periodic job-related examination, the CMA—

- a. Determines what (if any) functional activity or PPE limitations are necessary to protect the health of the worker.
- b. Discusses the limitations with the worker after reviewing the worker's job description.
- c. Informs the worker's supervisor of any work limitations or reasonable accommodations that will be needed to protect the health of the worker or to allow him or her to accomplish the essential functions of the job.
- d. If the worker is in the chemical PRP, informs the certifying official in a confidential manner of any potentially disqualifying information, along with the appropriate recommendation for restriction or disqualification.

3-9. Termination Examinations - Categories A and B personnel

The CMA will update the occupational exposure history and medical review of systems as previously described in paragraph 3-5. If as a result of any of the previous examinations, the individual was referred for specialty consultation, the CMA should refer the individual again for follow-up evaluation. A termination RBC-ChE will also be obtained.

3-10. Termination Examinations - Category C personnel

The CMA will update the occupational exposure history and medical review of systems as previously described in paragraph 3-6. A termination examination is not needed before termination of employment, but a termination RBC-ChE is required.

3-11. Termination Examinations - Category D personnel

A termination examination is not required unless the individual was in category A, B, or C at any time during their employment

3-12. RBC-ChE Monitoring - RBC-ChE Baseline

Determination of the individual's baseline RBC-ChE activity is required due to the variability between individuals. A baseline RBC-ChE is defined as the average of two separate measurements obtained at least 24 hours and no more than 14 working days apart. During the time between the two RBC-ChE measurements, the individual should not be allowed to enter agent-operating areas and should be warned to avoid exposure to any ChE-inhibiting substances. If these two measurements vary by more than 0.05 delta pH units, a third measurement should be obtained. In this case, the baseline RBC-ChE activity will then become the average value of all

three measurements. The RBC-ChE baselines may fluctuate in some workers monitored over a period of time. This fluctuation reflects the natural physiological enzyme variance in humans.

a. Elevation or depression of RBC-ChE activity greater than 10 percent of the baseline value is grounds for re-establishing a new RBC-ChE baseline, provided that organophosphate exposure is ruled out as the cause of any transient RBC-ChE depression. The elevation or depression must have been documented over a period of three months or longer by at least three separate ChE assays. An employee should not be in near proximity to nerve agents 24 hours before RBC-ChE draws for routine medical examination baseline re-establishment. This does not preclude emergency blood draws to rule out exposure.

b. As a minimum, an individual's RBC-ChE baseline must be re-computed once every three years. Follow the procedures described in this paragraph.

c. Any re-establishment, adjustment, or re-computation of the baseline value must be approved (that is, initialed off on the SF 512, Clinical record, plotting chart, or equivalent) by the CMA and must be accompanied by a medical record entry as to the reasons for re-establishment. The approved, re-computed baseline will be drawn in ink on a new SF 512 and annotated using the words "Recalculated Baseline" and the date of the re-computation. (NOTE: Locally approved, computer-generated forms may be used in lieu of SF 512s, as long as all other requirements are complied with.)

d. Re-establishment of RBC-ChE for Category D will consist of two blood draws 24 hours apart.

3-13. RBC-ChE Monitoring - Frequency of RBC-ChE monitoring

a. Category A,B,C, and D personnel. The RBC-ChE baseline must be established and then updated every three years (with two new blood draws) to detect any drift or change.

b. Potentially exposed workers. The RBC-ChE determinations should be performed as soon as practical following exposure. (NOTE: RBC-ChE determinations are not required to clinically manage the nerve agent-exposed casualty. They are used as part of the potential exposure evaluation to clinically confirm or rule out the occurrence of a nerve agent exposure.

Asymptomatic individuals who are being evaluated for potential exposure to nerve agents should not be returned to duties in nerve agent operating areas, until the absence of depression from baseline activity has been confirmed, see Appendix, Section II)

3-14. RBC-ChE Monitoring - Recording RBC-ChE monitoring determinations

a. The RBC-ChE determinations should be plotted on an SF 512 or a locally approved, computer-generated form. This plotting should show the actual RBC-ChE values or the percentage of RBC-ChE value expressed in percent of baseline versus time. If percentage values are plotted, note the absolute RBC-ChE determinations above the respective data points. File the SF 557, Miscellaneous Laboratory Slip, (or equivalent) with the RBC-ChE determinations from the laboratory in the patient's medical record.

b. Incorporate the SF 512 in the medical record per AR 40-66, paras 5-13 and 7-12. In the event that the SF 512 is maintained separately from the medical record (that is, in laboratory notebooks), insert an Optional Form (OF) 23, Charge-out Record, into the medical record identifying the responsible custodian.

c. Upon the employee's removal from the nerve agent medical surveillance program (which only occurs with a transfer to work activities not having a nerve agent exposure potential,

retirement, or a permanent change in duty station), place the SF 512 in the medical record per AR 40-66, para 5-13.

3-15. RBC-ChE Monitoring - Action levels

a. The RBC-ChE activity should be determined when signs and symptoms of systemic uptake of nerve agents are apparent. In addition, local (minor) signs, such as miosis or localized sweating, will necessitate an immediate RBC-ChE determination and immediate removal of the employee from further duties in nerve agent operating areas, until the RBC-ChE results are known.

b. In the event RBC-ChE depressions drop below 75 percent of the baseline value (that is, 25 percent depression in RBC-ChE activity), remove the affected individual(s) from further actual or potential nerve agent exposure. Perform RBC-ChE determinations weekly until the affected individual(s) return to work. Do not permit an individual to return to work in a nerve agent operating area until the—

(1) RBC-ChE has reached a value of at least 80 percent of the individual's baseline value and,

(2) The individual has been asymptomatic for at least 1 week. The CMA should annotate and initial the SF 512 indicating the period of removal from work referred to in paragraph 3-14.

c. Variations in RBC-ChE determinations greater than 10 percent from the baseline value (both low or high) shall be referred to the CMA for review. The CMA should document the resolutions of any variations in the medical record. The medical record entry should include the—

(1) Results of any relevant laboratory investigations.

(2) Occupational history.

(3) Air-monitoring results; if these are not applicable, such as the individual has not been in an agent operations area, a statement to that effect should be in the chart.

(4) Workplace investigations.

(5) Physical examinations.

(6) A physician's written opinion as to whether or not the ChE anomalies were related to the exposure to ChE-inhibiting substances.

d. As part of any potential exposure evaluation for nerve agents, the CMA must determine the worker's RBC-ChE activity and assess whether a depression from the RBC-ChE baseline has occurred before returning the individual to duties within a nerve agent operating area. If inhalation is the presumed route of exposure, the ChE activity depression may continue for up to one to two hours following exposure. Following liquid percutaneous nerve agent exposures, the ChE activity depression may continue for up to 12 to 16 hours following exposure. The CMA should consider these facts when confirming the absence of an RBC-ChE depression from baseline activity. If an RBC-ChE depression of greater than 10 percent is detected as part of a potential exposure evaluation, the CMA should attempt to—

(1) Correlate with any clinical signs or symptoms of nerve agent exposure.

(2) Determine concentration of nerve agent (in mg/m³) in the worker's immediate vicinity.

(3) Determine the duration of exposure sustained by the employee.

(4) Formulate a written opinion as to any nerve agent exposure effect.

e. For ChE depressions of 10 percent or greater that are associated with potential exposures to GB, GD, or GF, the CMA should consider obtaining urine samples for detection of phosphonic acid metabolites as described in TB MED 296. The following procedures should be followed

when collecting urine samples; they should also be done under close supervision by a health care provider to preclude the possibility of sample tampering.

(1) Provide clean urine cups for the collection.

(2) Immediately transfer 30 milliliters of urine to a plastic sample tube or container.

(3) Leave enough air space in the container to allow for the expansion of liquid contents in the frozen state. Sample containers made of non-breakable plastic, which can withstand cryogenic temperatures, need to be used during shipping.

(4) Collect urine immediately following suspected exposure. If possible, two additional urine specimens, with 30-milliliter aliquots, need to be obtained one (1) day and seven (7) days after exposure. The clinic should also provide a 30-milliliter urine sample obtained from a known unexposed individual to serve as a control.

(5) Place a tamper proof strip with the patient's name, social security number, and date on it across each tube or container with the patient's initials.

(6) Include a memorandum with the specimens, providing information on the time of suspected exposure, onset time of symptoms/signs (if any), baseline and post-exposure RBC-ChE activity results, possible nerve agents involved, patient's age and gender, as well as the CMA's name, address, and phone number.

(7) Ship all sealed containers in dry ice by overnight delivery to the U.S. Army Medical Research Institute of Chemical Defense, ATTN: MCMR-UV-PA, Applied Pharmacology Branch, 3100 Ricketts Point Road, APG, MD 21010-5400. If immediate shipping is not possible, urine samples need to be kept frozen.

Section 4 - Diagnosis and Treatment of Nerve Agent Intoxication.

4-1. General

This appendix—

a. Provides general information to medical personnel treating—

(1) Nerve-agent intoxication.

(2) The clinical effects of acetylcholinesterase inhibition, from nerve agents above or below the surety threshold as defined in AR 50-6, Table 6-2, and from research, development, test, and evaluation dilute solutions as defined in AR 50-6, Table 6-1. Although research, development, test, and evaluation solutions may be significantly less hazardous than pure undiluted nerve agents, research, development, test, and evaluation solutions may represent a significant exposure potential to highly toxic substances.

b. Is not intended to provide doctrine on self-aid, buddy-aid, or first aid to non-medical personnel.

4-2. Routes of entry

The routes of entry for nerve agents are inhalation and eye and skin absorption. Ingestion is rarely a route of entry.

4-3. Toxicology

a. Nerve agents GA, GB, GD, GF and VX are readily absorbed and are hazardous through all routes of exposure, in both liquid and vapor forms. The most prominent physiological effects

result from inhibition of the ChE enzymes distributed throughout the nervous system. The resultant excess acetylcholine at the site of the parasympathetic nerve endings produces—

(1) Characteristic muscarine-like effects including miosis, rhinorrhea, bronchoconstriction, and increased gastrointestinal motility.

(2) Nicotine-like effects including muscle fasciculations, weakness, or flaccid paralysis. The accumulation of excessive acetylcholine in the brain and spinal cord results in characteristic central nervous system effects such as difficulty in concentrating, anxiety, insomnia, restlessness, depression of the respiratory center, convulsions, or death.

b. A few controlled studies were conducted in an attempt to scientifically document potential long-term psychoneurological effects such as memory loss, decreased alertness, decreased problem-solving abilities, language problems, and decreased eye-hand coordination. No long-term effects from repeated low level exposure to nerve agents have been identified, except slowed electroencephalogram wave changes without clinical correlation.

c. Although certain organophosphate pesticides were shown to be teratogenic in animals, these effects were not documented in carefully controlled toxicological evaluations for nerve agents. Nerve agents are not thought to be developmentally toxic in doses that are not maternally toxic.

4-4. Signs and symptoms

a. The onset of the signs and symptoms following exposure to nerve agents may occur within seconds, minutes, or hours, depending upon the concentration, dosage, and route of entry, as well as the type and physical state of the nerve agent.

b. Nerve agents GA, GB, GD and GF pose primarily a vapor hazard to the unprotected worker. Exposure to low concentrations of GB vapor, for instance, will usually affect the eyes, nose, and/or lungs. These effects may occur within seconds of exposure and may reach their peak within several minutes after exposure ceases.

(1) Early, mild signs and symptoms of vapor exposure might include--

(a) Miosis, conjunctival injection, pain behind the eyes, dimness of vision, and/or blurred vision, with some reflex nausea and/or vomiting.

(b) Rhinorrhea or excessive salivation.

(c) Chest tightness, with minimal bronchorrhea with higher levels of vapor exposure.

Clinical manifestations may develop in organ systems, which were not in direct contact with the nerve agent vapor.

(2) Moderate nerve agent intoxication may include signs and symptoms of mild exposure, plus—

(a) An increase in shortness of breath, with coughing, wheezing, or voluminous bronchorrhea.

(b) Nausea, vomiting, or diarrhea.

(3) Severe signs and symptoms are those in which the central nervous system and multiple organ systems are involved. Severe nerve agent intoxication may include the signs and symptoms of moderate exposure, plus generalized weakness or fasciculations/twitching, loss of consciousness (within seconds), convulsions (within minutes), severe respiratory distress, flaccid paralysis, and apnea. These signs and symptoms have occurred within humans after one breath, within seconds to minutes following exposure to a high concentration of nerve agent GB. Peak effects will occur within minutes following a vapor exposure.

c. Effects from liquid percutaneous exposures to nerve agents, such as VX, are slower to develop and slower to reach their peak, compared to vapor exposures of the eyes or respiratory

tract. This is because nerve agent uptake across the skin is slower than via inhalation, and continued absorption of agent through the various skin layers can occur, even hours after the skin surface has been decontaminated. Signs and symptoms following large liquid percutaneous exposures may occur within 15 to 30 minutes after exposure; however, with small amounts of liquid on the skin, the latent period between exposure and clinical signs may be as long as 18 hours.

(1) Mild signs of liquid nerve-agent skin exposure may include localized sweating at the site of exposure, along with fine muscle fasciculations. (NOTE: Pinpoint pupils (miosis) are not an early sign of liquid skin exposure and may not be present at all in a mild or moderate exposure scenario. Miosis generally results from direct eye exposure to nerve agent vapor. Pinpoint pupils may or may not occur much later in a casualty who has sustained a large skin exposure to liquid nerve agent.)

(2) Moderate signs or symptoms of liquid nerve agent exposure may include those of mild vapor exposure, plus nausea, vomiting and/or diarrhea; headache; and a feeling of generalized weakness, but no respiratory signs or symptoms.

(3) Severe signs and symptoms may include miosis (from systemic uptake of nerve agents), generalized fasciculations and twitching, respiratory secretions, unconsciousness, convulsions, flaccid muscle paralysis, and apnea. The apnea is probably caused by central respiratory depression, although other factors, such as flaccid paralysis of the muscles of respiration or bronchoconstriction, may contribute to respiratory failure.

4-5. Treatment

a. The concepts of diagnosing and treating nerve agent casualties may be divided into five basic areas: self-protection, removal from exposure, maintenance of airway patency and ventilation, antidote administration, and supportive care. These concepts are applicable to each level of care provided to nerve agent casualties, whether the healthcare provider is located at the accident site, hotline, patient collection points, health clinics, or definitive-care facilities.

b. Self-protection. Although casualties contaminated with liquid nerve agent are unlikely to present directly to health care providers before decontamination in the field, medical personnel performing triage or supervising the initial treatment of nerve agent casualties should assume the presence of liquid-agent contamination, unless a "vapor only" exposure history is confirmed, or low-level air monitoring has documented the absence of residual nerve agent contamination. When handling potentially contaminated casualties, health care providers should wear air-purifying or atmosphere-supplying respirators, with a dermal protective ensemble covering exposed skin. Whenever possible, areas of known liquid contamination should be decontaminated prior to patient handling to minimize exposure risks; however, if the nerve agent casualty exhibits symptoms requiring two or more 2-mg doses of atropine or has significant injuries, properly protected medical personnel should respond to the contaminated site or the contamination reduction zone of the hotline to treat the patient. In industrial operations, such as demilitarization plants, the proximity of medical support allows medical personnel to arrive at the injury site early in the decontamination process. In this case medical personnel should don proper PPE and evaluate the exposed workers. This will allow for early diagnosis and treatment if required and will facilitate psychological support to the worker.

c. Removal from exposure. The old adage to "remove the patient from the puddle and the puddle from the patient" is the next appropriate step, after protecting yourself. If the hazard is from vapor alone, evacuation of the patient upwind from the exposure source may be sufficient.

For unmasked casualties who are unconscious or otherwise incapacitated, mask the casualty before evacuating. This is unnecessary after the casualty has been decontaminated in the field and is in a clean environment.

(1) Vapor-exposed nerve agent casualties should be decontaminated by removing all clothing in a clean air environment and shampooing or rinsing the hair to prevent vapor off-gassing.

(2) Liquid-exposed nerve agent casualties should be decontaminated by—

(a) Washing in warm or hot water at least three times. Use liquid soap (dispose of container after use and replace), copious amounts of water, and mild to moderate friction with a single-use sponge or washcloth in the first and second washes. Scrubbing of exposed skin with a brush is discouraged, because skin damage may occur and may increase absorption. The third wash should be a rinse with copious amounts of warm or hot water. Shampoo can be used to wash the hair. The rapid physical removal of a chemical agent is essential. If warm or hot water is not available, but cold water is, use cold water. Do not delay decontamination to obtain warm water.

(b) Rinsing the eyes, mucous membranes, or open wounds with sterile saline or water.

(3) The healthcare provider should—

(a) Check the casualty after the three washes to verify adequate decontamination (i.e., less than 1 WPL--the workplace airborne exposure limit) before allowing entry to the treatment area within the military or contractor-operated medical treatment facility. This may be done using a low level air monitoring device such as ACAMS or MINICAMS to detect any evidence of vapor off-gassing. If the washes were inadequate, repeat the entire process.

(b) Be prepared to administer antidote and or to stabilize conventional injuries during the decontamination process.

(c) Protect the airway while conducting decontamination and assure appropriate placement of the respirator over the uncontaminated face. The initial assessment of the casualty can best be performed in an agent-free environment where the health care provider is able to “look, listen, and feel” unencumbered by protective clothing. However, careful decontamination can be a time consuming process. The health care provider may have to enter the contaminated area to treat the casualty during this process.

d. Maintenance of airway patency and ventilation. Initial treatment of the nerve agent-intoxicated casualty should begin with the primary survey of airway, breathing, and circulation. Some degree of respiratory tract involvement is seen in most cases of nerve agent vapor intoxication. In conscious patients who have received relatively minor exposures, administration of atropine will reverse bronchoconstriction, reduce secretions, improve airflow, and reduce the work of breathing. However, severely intoxicated casualties with fulminant secretions, significant stridor or wheezing, agonal respirations, and an altered level of consciousness require the early establishment of a definitive airway. Here, the order of treatment and assessment may be best summarized as “AABC”, that is antidote, airway, breathing and circulation. Airway resistance may be initially high (50 to 70 centimeters of water) due to bronchoconstriction and copious secretions. Adequate atropinization will reverse these muscarinic effects of nerve agent intoxication and will allow easier ventilation. Endotracheal intubation is the airway of choice. Assisted ventilation with high partial pressures of oxygen may be required for up to several hours following exposure for individuals with flaccid paralysis or central respiratory depression. Periodic suctioning of secretions will also improve ventilation and enhance air exchange.

e. Antidote administration. Three medications are used to treat the signs and symptoms of nerve-agent intoxication: atropine, pralidoxime chloride, and diazepam. The general indications

for use of these antidotes are discussed first, followed by a discussion of their use in the treatment of mild, moderate, or severe nerve-agent intoxication.

(1) Atropine is an anticholinergic compound, which antagonizes the muscarinic effects of acetylcholine. It may be administered intramuscularly (IM), intravenously (IV), or through the endotracheal tube. Parenteral atropine will reverse muscarinic effects such as rhinorrhea, salivation, sweating, bronchoconstriction, bronchorrhea, nausea, vomiting, and diarrhea. Miosis and ciliary body spasms are not reversed by parenteral atropine; relief of intractable pain in or around the eye requires the instillation of 1 percent homatropine or atropine, repeated as needed at intervals of several hours for 1 to 3 days. Severe symptoms may require the local instillation of 1 percent atropine sulfate ointment. Although the intravenous route of atropine administration is preferred when treating systemic effects, it should be avoided in hypoxemic patients, since studies have documented the occurrence of ventricular fibrillation when atropine is administered IV to hypoxemic animals. The initial parenteral dose is 2 to 6 mg, with subsequent doses titrated to the severity of nerve-agent signs and symptoms. Side effects in non-exposed individuals may include tachycardia, dry mouth, blurred vision, mydriasis, a very transient atrio-ventricular dissociation, mild sedation, and delirium in doses greater than 10 mg. The greatest potential problem from the administration of atropine in a non-nerve-agent-intoxicated person is inhibition of sweating; this with exertion can cause heat injury in warm weather.

(2) Pralidoxime chloride (2-PAMCl) is an oxime, which displaces the nerve agent from the esteratic site of ChE when administered before aging of the affected enzyme takes place. (NOTE: 2-PAMCl is particularly effective in reactivating ChE enzymes following exposures to GA, GB, GF and VX; it is ineffective in reactivating ChE systems poisoned by GD due to the rapid aging phenomenon seen with this nerve agent). Pralidoxime chloride reverses some of the nicotinic effects of acetylcholine, principally skeletal muscle fasciculations, twitching, and fatigue. The initial dose is 600 mg IM; 2-PAMCl may also be administered by intravenous infusion (1 gram in 250 cubic centimeters of Normal Saline), given over a 20 to 30 minute time period. The principal side effects from 2-PAMCl in a non-poisoned person are dizziness, blurred vision, double vision, dysgeusia, and nausea/vomiting. Hypertension may be seen at high doses (greater than 15 milligrams per kilogram body weight) but may be treated with intravenous phentolamine (5 mg intravenous push). Administration can be IM or IV; if the IV route is selected, it must be given very SLOWLY. In the military medical supply system, atropine and 2-PAMCl are packaged together as auto-injectors in the MARK I kit for the field expedient administration of these antidotes. Each MARK I kit contains 2 mg of atropine sulfate in one injector and 600 mg of pralidoxime chloride in a second injector. Each chemical agent worker is issued three MARK I kits inside the protective mask carrier for personal use. Individuals handling MARK I kits that have been discharged (either accidentally or as part of patient treatment) should not attempt to cap or bend the needles, or place the spent kits in the mask carrier. Instead, the MARK I kits should be disposed of in large sharps containers that have been pre-positioned in all work areas in which it can reasonably be anticipated that MARK I kits might be used.

(3) Diazepam is an anticonvulsant drug used to decrease seizure activity and to reduce brain injury caused by prolonged seizures. Animal studies have clearly indicated a correlation between prolonged seizure activity and the occurrence of brain injuries following nerve agent GD exposure. Although there are no controlled animal studies to support the use of diazepam, "preconvulsant" treatment for other than severely intoxicated GD casualties, the health care provider should consider the use of diazepam in unconscious, severely intoxicated GB or VX casualties, after administering atropine and pralidoxime chloride. The initial dose of diazepam is

2 to 5 mg IV or 10 mg IM, with additional doses as required. Diazepam intravenous doses of greater than 20 mg may be required to ablate an active nerve agent-induced convulsions.

(4) Mild nerve-agent intoxication may occur following vapor or liquid exposures and has a varied clinical presentation. The occurrence of miosis and rhinorrhea alone following vapor exposures generally requires observation only. If accompanied by chest tightness or upper respiratory tract secretions, which do not subside, an initial dose of 2 mg IV or IM atropine should be given, with repeat doses given at 5 to 10 minute intervals as required. (A patient has been adequately atropinized when secretions are diminishing and ventilation is accomplished with ease; the need for more atropine should never be assessed by pulse rate or the presence of miosis.) Treatment of mild liquid exposures is more problematic, due to the slower uptake and onset of clinical effects. The onset of sweating or muscle fasciculations at a known site of liquid exposure within 1 to 2 hours suggests the imminent development of more serious, systemic effects and should be treated with 2 mg of atropine IM or IV and 600 mg of 2-PAMCl IM or 1 gram of 2-PAMCl very slowly (20 to 30 minutes) IV.

(5) Moderate symptoms of nerve-agent intoxication following a vapor exposure should be treated more aggressively if significant respiratory distress is present, along with muscular weakness, fasciculations, or gastrointestinal effects. The initial dose of atropine should be 4 mg IM or IV, accompanied by 1,200 mg of pralidoxime chloride IM (2 injectors) or 1 gram IV as previously described. If exposure was to vapor alone, this should be adequate therapy, although repeat doses may be given at 5 to 10-minute intervals. If moderate intoxication has occurred within several hours following liquid percutaneous exposure, repeated doses of atropine and 2-PAMCl may be required. The onset of gastrointestinal symptoms delayed more than 6 hours after liquid exposures may be treated adequately with 2 mg of atropine, accompanied by 600 mg of pralidoxime chloride.

(6) Severe nerve-agent intoxication requires the immediate establishment of a definitive airway, along with an assessment of ventilation and perfusion. Respiratory failure also requires aggressive antidote administration to relieve bronchospasm, minimize secretions, reduce the work of breathing, and improve respiratory muscle function. For these patients, the initial dose of atropine should be 6 mg. Additional atropine by the IV route, once hypoxemia has been reversed, should be given at 3 to 5-minute intervals as required to support airway management. Severely intoxicated casualties may require up to 15 to 20 mg atropine over the first 3 hours of treatment. An IV infusion of 2-PAMCl should be given as previously described, with 1-gram infusions repeated at hourly intervals as required, for up to three doses. Diazepam should be used in patients who are seizing and should be considered for use in patients who have signs of severe intoxication whether or not they are seizing.

f. Supportive care. In the peacetime environment, moderate to severe nerve agent exposures are unlikely to occur except in the setting of laboratory accidents, storage disposal, remediation sites or after terrorist attacks. Under these conditions, other conventional injuries may be superimposed upon the nerve agent exposure. The priorities for emergency medical treatment of mixed conventional-nerve agent casualties should be based upon traditional priorities established for advanced cardiac life support and advanced trauma life support. Primacy should always be given to maintaining airway, breathing and circulation. Other injuries or illnesses uncovered during the secondary survey should be treated with available resources after resuscitative care has been rendered. Fluid and electrolyte requirements are usually minimal, unless superimposed burns or blood loss cause a decrease in cardiac output. Head trauma may be difficult to assess when seen in association with the altered levels of consciousness and pupillary changes of a

severe nerve agent vapor exposure and may require early neurosurgical consultation. *Torsades de pointes*, a rapid, multifocal ventricular arrhythmia, has been reported in humans following organophosphorus-pesticide intoxication and may require immediate treatment following the latest advanced cardiac life support guidelines.

Section 5 - Potential Exposure Evaluation Criteria for GB and VX Nerve Agents.

5-1. Introduction

Certain medical evaluations must be performed in the event of an accidental exposure or potential exposure to nerve agents. This appendix provides guidance to field personnel as to the criteria to be used for conducting potential exposure evaluations during GB and VX operations. These criteria have been developed with input from the field to ensure that medical evaluations of potentially exposed individuals take place whenever the potential for medically significant dermal or respiratory exposure exists.

a. An exposed worker is an individual who works in a nerve agent operating area and who exhibits clinical signs or symptoms of nerve agent intoxication. The individual should be presumed to have been exposed to nerve agents (even if asymptomatic) if—

(1) An acute depression in ChE activity of 10 percent or greater from their RBC-ChE baseline has occurred.

(2) No immediate history of contact with other ChE-inhibiting substances or a corresponding reduction in red cell mass exists.

(3) Urine assays confirm the presence of phosphonic acid metabolites specific for nerve agents (see TB MED 296).

b. A potentially exposed worker is an individual who—

(1) Works in an agent operating area where levels of nerve agent exceed the protective capability of the PPE or are detectable at or above the applicable airborne exposure limits.

(2) Has experienced a breach in the PPE or a failure in engineering controls.

5-2. Policies

These potential exposure guidelines apply to potential exposure scenarios to nerve agents in training, and in storage, disposal, non-stockpile, and laboratory operations. The only exception made for live agent training is that a potential exposure evaluation is not required solely for training conducted in air purifying respirators in known liquid contaminated environments; signs or symptoms of nerve agent exposure or fulfillment of other listed criteria would trigger a potential exposure evaluation under live agent training circumstances.. See paragraph 5-3 for potential exposure criteria.

a. All operational events meeting the potential exposure criteria shall be reported immediately to the installation or chemical activity commander. Any exposed or potentially exposed worker shall be sent immediately to the supporting medical facility for a medical evaluation (see paragraph 2-8 and Appendix).

b. Potentially exposed individuals should not be returned to duty in an agent operating area until the CMA has medically cleared them. The agent operating area is any portion of an agent area where workers are actively conducting agent operations.

5-3. Criteria

a. GB operations. Individuals shall be considered potentially exposed when any one of the following criteria are met.

(1) GB concentrations exceed the authorized level for the PPE being worn during entry. The authorized levels are—

(a) ≥ 50 WPL (0.005 mg/m^3) for M40 respirators and other air purifying respirators approved by the Office of the Director of Army Safety for chemical agent operations.

(b) $\geq 10,000$ WPL (1 mg/m^3) for an self-contained breathing apparatus or combination airline respirator with an auxiliary self-contained breathing apparatus worn with ensembles other than the DPE.

(c) $\geq 100 \text{ mg/m}^3$ for DPE. NOTE: The National Institute of Occupational Safety and Health has designated the assigned protection factor of 50 for negative pressure, air purifying respirators and 10,000 for self-contained breathing apparatuses. The limit of 100 mg/m^3 for DPE entries is based on human volunteer testing conducted in 1976.

(2) A breach or tear occurs during entry in a DPE, modified Army level A, or Army level A ensembles, and nerve agent vapor is detectable at or above 50 WPL (0.005 mg/m^3) or liquid contamination is known to exist.

(3) Loss of engineering controls, upset conditions, or mishaps which result in a nerve agent concentration $\geq 0.0004 \text{ mg/m}^3$ in areas where the individual was unprotected (that is, no respiratory protection for nerve agents is being worn).

(4) An individual develops signs or symptoms consistent with nerve agent exposure effect during entry, and nerve agent vapor is detectable at or above the WPL (0.0001 mg/m^3), or liquid contamination is known to exist.

(5) A DPE cut out in an airlock occurs in which the agent concentration is ≥ 50 WPL (0.005 mg/m^3), and the DPE wearer is switched from the SCBA backpack to an M40 respirator.

(6) DPE life support systems' air sampling indicates agent concentrations $\geq 0.0004 \text{ mg/m}^3$ during entry.

b. VX operations. Individuals shall be considered potentially exposed when any one of the following criteria are met.

(1) VX agent concentrations exceed the authorized level for the PPE being worn during entry. The authorized levels are as follows—

(a) ≥ 50 WPL (0.0005 mg/m^3) for M40 respirators and other air purifying respirators approved by the Office of the Director of Army Safety for chemical agent operations.

(b) $\geq 10,000$ WPL (0.1 mg/m^3) for an self-contained breathing apparatus or a combination airline respirator with an auxiliary self-contained breathing apparatus worn with ensembles other than DPE.

(c) $\geq 100 \text{ mg/m}^3$ for DPE entries.

(2) A breach or tear occurs in a DPE, modified Army level A, or Army level A ensembles, and nerve agent vapor is detectable at or above 50 WPL (0.0005 mg/m^3) or liquid contamination is known to exist.

(3) A loss of engineering controls, upset conditions, or mishaps which result in agent concentrations $\geq 0.00004 \text{ mg/m}^3$ occur in areas where the individual was unprotected (that is, no respiratory protection for nerve agents is worn).

(4) An individual develops signs or symptoms consistent with nerve agent exposure effect during entry.

(5) A DPE cut out in an airlock occurs in which the agent concentration is ≥ 50 WPL (0.0005 mg/m^3), and the DPE wearer is switched from the self-contained breathing apparatus backpack to an M40 respirator.

(6) DPE life support systems' air sampling indicates agent concentrations $\geq 0.0004 \text{ mg/m}^3$ during entry.

Appendix

Medical Evaluation of Respirator Wearers and Potential Exposures to Nerve Agents

Section I

The OSHA Respirator Questionnaire

MEDICAL RECORD—SUPPLEMENTAL MEDICAL DATA

For use of this form see AR 40-66; the proponent agency is the Office of The Surgeon General

REPORT TITLE

OSHA RESPIRATOR QUESTIONNAIRE

OTSG APPROVED (Date)

1. Your age (to nearest year):

2. Sex (circle one): Male/Female

3. Your height: ft. in.

4. Your weight: lbs.

5. Your job title:

6. A phone number where you can be reached by the healthcare professional who reviews this questionnaire (include the Area Code):

7. The best time to phone you at this number:

8. Has your employer told you how to contact the healthcare professional who will review this questionnaire (circle one): Yes/No

9. Check the type of respirator you will use (you can check more than one category, if applicable):

a. N. R. or P disposable respirator (filter-mask, non-cartridge type only).

b. Other type (for example, half- or full-face piece type, powered-air purifying, supplied-air, self-contained breathing apparatus).

10. Have you worn a respirator (circle one): Yes/No

If "yes," what type(s):

Part A. Section 2. (Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you currently smoke tobacco or have you smoked tobacco in the last month: Yes/No

2. Have you ever had any of the following conditions?

a. Seizures (fits): Yes/No

b. Diabetes (sugar disease): Yes/No

(continued top of next column)

c. Allergic reactions that interfere with your breathing: Yes/No

d. Claustrophobia (fear of closed-in places): Yes/No

e. Trouble smelling odors: Yes/No

3. Have you ever had any of the following pulmonary or lung problems?

a. Asbestosis: Yes/No

b. Asthma: Yes/No

c. Chronic bronchitis: Yes/No

d. Emphysema: Yes/No

e. Pneumonia: Yes/No

f. Tuberculosis: Yes/No

g. Silicosis: Yes/No

h. Pneumothorax (collapsed lung): Yes/No

i. Lung cancer: Yes/No

j. Broken ribs: Yes/No

k. Any chest injuries or surgeries: Yes/No

1. Any other lung problem that you've been told about: Yes/No

4. Do you currently have any of the following symptoms of pulmonary or lung illness?

a. Shortness of breath: Yes/No

b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes/No

c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes/No

(continued top of next column)

d. Have to stop for breath when walking at your own pace on level ground: Yes/No

e. Shortness of breath when washing or dressing yourself: Yes/No

f. Shortness of breath that interferes with your job: Yes/No

g. Coughing that produces phlegm (thick sputum): Yes/No

h. Coughing that wakes you early in the morning: Yes/No

i. Coughing that occurs mostly when you are lying down: Yes/No

j. Coughing up blood in the last month: Yes/No

k. Wheezing: Yes/No

l. Wheezing that interferes with your job: Yes/No

m. Chest pain when you breath deeply: Yes/No

n. Any other symptoms that you think may be related to lung problems: Yes/No

5. Have you ever had any of the following cardiovascular or heart problems?

a. Heart attack: Yes/No

b. Stroke: Yes/No

c. Angina: Yes/No

d. Heart failure: Yes/No

e. Swelling in your legs or feet (not caused by walking): Yes/No

f. Heart arrhythmia (heart beating irregularly): Yes/No

g. High blood pressure: Yes/No

(Continue on reverse)

PREPARED BY (Signature & Title)

DEPARTMENT/SERVICE/CLINIC

DATE

PATIENT'S IDENTIFICATION (For typed or written entries give: Name—last, first, middle; grade; date; hospital or medical facility)

- | | |
|--|--|
| <input type="checkbox"/> HISTORY/PHYSICAL | <input type="checkbox"/> FLOW CHART |
| <input type="checkbox"/> OTHER EXAMINATION OR EVALUATION | <input type="checkbox"/> OTHER (Specify) |
| <input type="checkbox"/> DIAGNOSTIC STUDIES | |
| <input type="checkbox"/> TREATMENT | |

5. Have you ever had any of the following cardiovascular or heart problems? (Cont'd)

h. Any other heart problem that you've been told about: Yes/No

6. Have you ever had any of the following cardiovascular or heart symptoms?

a. Frequent pain or tightness in your chest: Yes/No

b. Pain or tightness in your chest during physical activity: Yes/No

c. Pain or tightness in your chest that interferes with your job: Yes/No

d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No

e. Heartburn or indigestion that is not related to eating: Yes/No

f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No

7. Do you currently take medication for any of the following problems?

a. Breathing or lung problems: Yes/No

b. Heart trouble: Yes/No

c. Blood pressure: Yes/No

d. Seizures (fits): Yes/No

8. If you've used a respirator, have you ever had any of the following problems? (If you've never used a respirator, check the following space and go to question 9:)

a. Eye irritation: Yes/No

b. Skin allergies or rashes: Yes/No

c. Anxiety: Yes/No

d. General weakness or fatigue: Yes/No

e. Any other problem that interferes with your use of a respirator: Yes/No

9. Would you like to talk to the healthcare professional who will review this questionnaire about your answers to this questionnaire: Yes/No

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-face piece respirator or a self-contained breathing apparatus. For employees who have been selected to use other types of respirators, answering these questions is voluntary.

(continued top of next column)

10. Have you ever lost vision in either eye (temporarily or permanently): Yes/No

11. Do you currently have any of the following vision problems?

a. Wear contact lenses: Yes/No

b. Wear glasses: Yes/No

c. Color blind: Yes/No

d. Any other eye or vision problem: Yes/ No

12. Have you ever had an injury to your ears, including a broken ear drum: Yes/No

13. Do you currently have any of the following hearing problems?

a. Difficulty hearing: Yes/No

b. Wear a hearing aid: Yes/No

c. Any other hearing or ear problem: Yes/ No

14. Have you ever had a back injury: Yes/No

15. Do you currently have any of the following musculoskeletal problems?

a. Weakness in any of your arms, hands, legs, or feet: Yes/No

b. Back pain: Yes/No

c. Difficulty fully moving your arms and legs: Yes/No

d. Pain or stiffness when you lean forward or backward at the waist: Yes/No

e. Difficulty fully moving your head up or down: Yes/No

f. Difficulty fully moving your head side to side: Yes/No

g. Difficulty bending at your knees: Yes/No

h. Difficulty squatting to the ground: Yes/ No

i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Yes/No

j. Any other muscle or skeletal problem that interferes with using a respirator: Yes/No

(continued top of next column)

Part B: Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the healthcare professional who will review the questionnaire.

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: Yes/No

If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: Yes/No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes/No

If "yes," name the chemicals if you know them:

3. Have you ever worked with any of the materials, or under any of the conditions, listed below:

a. Asbestos: Yes/No

b. Silica (e.g., in sandblasting): Yes/No

c. Tungsten/cobalt (e.g., grinding or welding this material): Yes/No

d. Beryllium: Yes/No

e. Aluminum: Yes/No

f. Coal (for example, mining): Yes/No

g. Iron: Yes/No

h. Tin: Yes/No

i. Dusty environments: Yes/No

j. Any other hazardous exposures: Yes/No

If "yes," describe these exposures:

4. List any second jobs or side businesses you have:

5. List your previous occupations:

6. List your current and previous hobbies:

7. Have you been in the military services? Yes/No

If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes/No

8. Have you ever worked on a HAZMAT team? Yes/No

(continued top of next page)

CLINICAL RECORD

Report on S.F. _____
or
Continuation of DA 4700 RESPIRATORY MEDICAL QUESTIONNAIRE
(Strike out one line) (Specify type of examination or data)

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No

If "yes," name the medications if you know them:

10. Will you be using any of the following items with your respirator(s)?

a. HEPA Filters: Yes/No

b. Canisters (for example, gas masks): Yes/ No

c. Cartridges: Yes/No

11. How often are you expected to use the respirator(s) (circle "yes" or "no" for all answers that apply to you):

a. Escape only (no rescue): Yes/No

b. Emergency rescue only: Yes/No

c. Less than 5 hours per week: Yes/No

d. Less than 2 hours per day: Yes/No

e. 2 to 4 hours per day: Yes/No

f. Over 4 hours per day: Yes/No

12. During the period you are using the respirator(s), is your work effort:

a. Light (less than 200 kcal per hour): Yes/ No

(continued top of next column)

(Sign and date)

If "yes," how long does this period last during the average shift: hrs. mins.

Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1 - 3 lbs.) or controlling machines.

b. Moderate (200 to 350 kcal per hour): Yes/No

If "yes," how long does this period last during the average shift: hrs. mins.

Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 Lbs) on a level surface.

c. Heavy (above 350 kcal per hour): Yes/ No

If "yes," how long does this period last during the average shift: hrs. mins.

Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working on a loading dock shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 Lbs).

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when you're using your respirator: Yes/No

If "yes," describe this protective clothing and/or equipment:

(continued top of next column)

14. Will you be working under hot conditions (temperature exceeding 77° F: Yes/No

15. Will you be working under humid conditions: Yes/No

16. Describe the work you'll be doing while you're using your respirator(s):

17. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

18. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):

Name of the first toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift

Name of the second toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift:

Name of the third toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift:

The name of any other toxic substances that you'll be exposed to while using your respirator:

Page 3 of 3

(Continue on reverse side)

PATIENT'S IDENTIFICATION (For typed or written entries give: Name - last, first, middle; grade; date; hospital or medical facility)

REGISTER NO.

WARD NO.

REPORT ON _____ or CONTINUATION OF DA 4700

Standard Form 507

GENERAL SERVICES ADMINISTRATION AND
INTERAGENCY COMMITTEE ON MEDICAL RECORDS
FPMR 101-11.80 6-8
OCTOBER 1975

507-106

MEDICAL CLEARANCE FOR RESPIRATOR USE

Name _____

Date _____

SS# _____

Date of Birth _____

Sex ____M ____F

Height ____ft ____in Weight ____lbs ____

Job Title _____

Employer _____

Type of Respirator Used (Circle all that apply)

Full-face negative pressure air purifying

Emergency escape device

Powered air-purifying respirator

Other (list) _____

Level of Work Effort (Circle one)

Light

Moderate

Heavy

Strenuous

Extent of Usage

Daily Occasionally Rarely – or for emergency escape purposes

Length of Time of Anticipated Effort in Hours

Special work Considerations (that is, high places, temperature, or protective clothing)

Employer Representative

Written Recommendation for Use of Respiratory Protective Devices

I have completed a medical evaluation of _____ for the use of the respiratory device(s) listed above and in compliance with 29 CFR 1910.134 effective April 8, 1998. Based upon my evaluation, I find that this individual is/is not able to wear these device(s) in a safe and healthful manner. I have/have not identified the following limitations on the use of these respirator:

In my judgment, this individual does/does not require a follow-up medical examination to make a final determination as to their ability to wear the respiratory protective devices listed above.

The individual named above has been given a copy of this written recommendation and has been advised to request a follow-up medical evaluation if he or she develops medical signs or symptoms, which impair his or her ability to safely use this respiratory protective device as intended.

Printed signature and title of licensed healthcare practitioner

Date

Section II
Potential Exposure Evaluation Data Sheet and Clinical Record Form

<p>DATA SHEETS FOR COLLECTING INFORMATION ON CHEMICAL AGENT EXPOSED OR POTENTIALLY EXPOSED WORKERS</p>
--

1. Name of worker: _____ SYMPTOMATIC? YES NO

If symptomatic, please describe:

2. Chemical Agent Exposure Information:

(CIRCLE THE CORRECT ITEMS)

PHYSICAL STATE: VAPOR

GB

VX

HD

POTENTIAL ROUTE: EYE INHALATION

SKIN

LIQUID

3. Level of PPE worn

(CIRCLE THE CORRECT ITEMS)

DPE LEVEL A

LEVEL B

TAPES

MASK

GLOVES

BOOTS

APRON

SLUNG MASK COVERALLS

IMPREGS

OTHER: _____

4. Estimated time at which event occurred:

duration of exposure/potential exposure: _____

time elapsed since initial event:

5. Estimated concentration of agent in workplace where exposure occurred:

(IF KNOWN)

_____ mg/m³

or

_____ x TWA

6. Was the detection of agent confirmed by a second means of detection?

(CIRCLE THE CORRECT ITEM)

YES

NO

PENDING

7. Has the exposed or potentially exposed worker:

(CIRCLE THE CORRECT ITEM)

changed and removed clothing:

YES

NO

been showered or decontaminated?

YES

NO

received any treatment?

YES

NO

IF TREATMENT HAS BEEN RECEIVED, PLEASE DESCRIBE:

Information received from:

Name of clinic person recording data:

Date and time information was recorded:

POTENTIAL EXPOSURE EVALUATION CLINICAL RECORD FORM

Date_____ Time_____ PRP Notification ☐

Body Temp_____ Blood Pressure_____ Pulse Rate_____ Respiratory Rate_____

Body Weight_____lbs

POTENTIAL AGENT GB ☐ VX ☐ OTHER ☐

CHIEF COMPLAINT/EXPOSURE HISTORY:

REVIEW OF SYSTEMS

	NO	YES		NO	YES
DIM VISION	<input type="checkbox"/>	<input type="checkbox"/>	RUNNY NOSE	<input type="checkbox"/>	<input type="checkbox"/>
BLURRED VISION	<input type="checkbox"/>	<input type="checkbox"/>	DYSPNEA	<input type="checkbox"/>	<input type="checkbox"/>
EYE PAIN	<input type="checkbox"/>	<input type="checkbox"/>	CHEST TIGHTNESS	<input type="checkbox"/>	<input type="checkbox"/>
HEADACHE	<input type="checkbox"/>	<input type="checkbox"/>	COUGHING	<input type="checkbox"/>	<input type="checkbox"/>
NAUSEA	<input type="checkbox"/>	<input type="checkbox"/>	WHEEZING	<input type="checkbox"/>	<input type="checkbox"/>
VOMITING	<input type="checkbox"/>	<input type="checkbox"/>	SWEATING	<input type="checkbox"/>	<input type="checkbox"/>
DIARRHEA	<input type="checkbox"/>	<input type="checkbox"/>	WEAKNESS	<input type="checkbox"/>	<input type="checkbox"/>

PHYSICAL EXAMINATION

EYE:

	NO	YES (DESCRIBE)
LACRIMATION	<input type="checkbox"/>	<input type="checkbox"/> _____
CONJUNCTIVAL REDNESS	<input type="checkbox"/>	<input type="checkbox"/> _____
BLEPHAROSPASM	<input type="checkbox"/>	<input type="checkbox"/> _____
ABNORMAL PUPIL REACTIVITY	<input type="checkbox"/>	<input type="checkbox"/> _____
PUPIL SIZE	OD_____ millimeters	OS_____ millimeters

RESPIRATORY

	NO	YES (DESCRIBE)
STRIDOR	<input type="checkbox"/>	<input type="checkbox"/> _____
WHEEZES	<input type="checkbox"/>	<input type="checkbox"/> _____
RHONCHI	<input type="checkbox"/>	<input type="checkbox"/> _____
RHINORRHEA	<input type="checkbox"/>	<input type="checkbox"/> _____
BRONCHORRHEA	<input type="checkbox"/>	<input type="checkbox"/> _____
SALIVATION	<input type="checkbox"/>	<input type="checkbox"/> _____

SKIN

NO

YES (DESCRIBE)

SWEATING

☐☐

NEUROMUSCULAR

NO

YES (DESCRIBE)

FASCICULATIONS

☐☐

TWITCHING

☐☐

WEAKNESS

☐☐

OTHER FINDINGS:

BASELINE ChE _____

CURRENT ChE _____ DATE/TIME _____

IMPRESSION:

PLAN:

CMA SIGNATURE

DATE

CMA STAMP

Interim Guidance on Mustard Agent Decontamination and Medical Services in the Industrial Setting

Section 1 – Information and Recordkeeping.

1-1. Information and reporting requirements

a. The installation commander or chemical activity commander, in coordination with other appropriate personnel, provides the following information to the Competent Medical Authority (CMA):

- (1) A copy of this guidance.
- (2) A written description of the affected individual's duties as they relate to the mustard agent exposure potential in routine or emergency operations.
- (3) The air-monitoring results of an individual's potential exposure, measured or estimated, under the circumstances defined in Section 5.

(4) A description of any personal protective equipment (PPE) used or to be used.

b. If an individual is removed from work because of signs and symptoms commonly associated with exposure to mustard agents or if the CMA believes that a potential exposure evaluation provides clinical or biochemical evidence of a mustard agent exposure effect, the occurrence should be—

(1) Immediately reported by CMA to the installation commander, chemical activity commander, or site project manager or his or her designated representative.

(2) Reported to the certifying official (if a chemical surety related event, see AR 50-6) as potentially disqualifying information.

(3) Documented in the medical record.

(4) Reported through the Reportable Medical Events System as soon as possible after the diagnosis has been made or within 48 hours (applicable to government-operated U.S. Army Medical Department clinics and hospitals only). For information on reporting requirements and procedures, see <http://www.amsa.army.mil>.

1-2. Record keeping

a. General. The occupational and environmental health medical surveillance program as described in AR 40-5 is composed of both general medical and workplace surveillance and job-specific surveillance. The job-specific surveillance is based on the physical requirements and exposure risks of specific jobs. The mustard agent medical surveillance program is a job-specific surveillance program and is a part of the overall occupational and environmental health program. The CMA shall maintain the medical records of personnel enrolled in the mustard agent medical surveillance program in accordance with the requirements of AR 40-66, AR 40-5, and 29 CFR 1910.1020. The medical record should include the results of post-offer, pre-placement; periodic job-related; and termination examinations (see Sections 2 and 3 and Appendix), as well as respirator screenings/clearances and the results of any mustard agent exposure or potential exposure evaluations. Civilian medical records (x-rays) must be maintained for 40 years or the duration of the individual's employment plus 30 years, whichever is longer. (See AR 40-66, para 7-10a). The remainder of the medical record must be retained for the duration of employment plus 30 years per 29 CFR 1910.1020 (d) (1) (i).

b. Air-monitoring records. Documentation of a worker's exposure potential to mustard agents is important in assessing the present and past exposure history and in documenting compliance with the established Airborne Exposure Limit (AEL).

(1) The installation commander or chemical activity commander will designate qualified personnel to maintain, interpret, correlate, and transmit air monitoring records. (See DA Pam 385-61, para 3-7a through c.)

(2) The CMA incorporates atmospheric monitoring data on exposed workers or potentially exposed workers (see glossary) into the medical record on Standard Form (SF) 600 (Medical Record – Chronological Record of Medical Care), DA Form 4700 (Medical Record - Supplemental Medical Data), or other appropriate forms. (See Section 5 for criteria for potential exposure.) Any medical record entry of exposure or potential exposure above prescribed Worker Population Limits (WPLs), Short-Term Exposure Limits (STELs), or Immediately Dangerous to Life or Health (IDLH) values shall include—

(a) The date, location, and results of each air sample taken, and whether confirmation of the results was obtained through a second analytical method of detection.

(b) The physical state of the mustard agent, potential route of exposure, time of occurrence, estimated duration of exposure or potential exposure, and type of PPE worn. An example of a medical data sheet that can be used to collect such information is provided in Appendix Section II.

c. Employee access. The CMA—

(1) Provides the affected individuals, former employees, or their designated representatives access to the air-monitoring records associated with exposure or potential exposure evaluations. (See DA Pam 385-61, para 3-7d.)

(2) Makes available the medical records containing the examination content described in paragraph 1-1a for inspection and copying per AR 40-66, AR 50-6, and 29 CFR 1910.1020.

1-3. Employee health education

a. Employee health training. The CMA reviews and concurs or non-concurs with all employee-training materials, standing operating procedures (SOPs), or plans dealing with issues such as contamination avoidance, personal protection, decontamination procedures, buddy-aid, self-aid, and essential first aid practices.

b. Access to health education materials. The CMA coordinates with the installation commander, chemical activity commander, or site project manager to ensure that a copy of all health education materials used in the health education program or training are readily available to all individuals with the potential for exposure.

c. Hazard communication information. Methods of instruction may include formal classes, work area meetings, audiovisual and computer-based presentations as appropriate. As a minimum, the installation commander, chemical activity commander, or site project manager shall annually repeat health-related training as described below.

(1) The installation commander, chemical activity commander, or site project manager, with technical assistance from the CMA, shall, through a written hazard communication program, define the mechanisms for training workers about the exposure potential to mustard agents and the protective measures necessary for the job.

(2) The following mustard agent specific items should be included in the employee hazard communication training—

(a) An explanation of the types of operations in the individual's workplace that have a mustard agent exposure potential.

(b) Methods used by the installation or chemical activity to recognize and evaluate work areas with a mustard agent exposure potential.

(c) An explanation of the potential acute and chronic health effects associated with mustard agent exposure and the purpose and description of the mustard agent medical surveillance program (see Sections 2 and 3 and Appendix).

(d) Protective measures to include administrative and engineering controls, PPE, safe work practices, and emergency procedures to include self-aid, buddy-aid, first aid, and decontamination.

(e) An explanation of the mustard agent material safety data sheets (MSDSs) and applicable SOPs to assure that mustard agent materials are handled and stored per SOPs and DA regulations.

(f) Emergency evacuation and notification procedures.

(3) The CMA shall provide technical assistance, monitor selected training sessions, and approve, in writing, the program of instruction and lesson plans.

(4) The installation commander, chemical activity commander, or site project manager documents hazard communication training, in writing, to include the signature of both the trainee and the approving authority as well as the date of the training. Document training for all DA employees on Department of Defense (DD) Form 1556 (Request, Authorization, Agreement and Certification of Training and Reimbursement) or other appropriate forms, and incorporate this documentation permanently in the employee's official personnel folder.

1-4. Material safety data sheets

a. The employee must have direct access to the MSDS' content and location. The MSDS are products of the material developer. To obtain copies of the current MSDS, contact the U.S. Army Soldier, Biological Chemical Command, ATTN: AMSSB-RCB-RS (Safety Office), Building 3330, Aberdeen Proving Ground, MD 21010-5423 or access <http://www.sbccom.apgea.army.mil/RDA/msds/index.htm>.

b. Since the MSDS' content may change with time, the MSDS may not always represent the medical guidance provided by the Office of The Surgeon General. Questions concerning medical guidance provided in the MSDSs may be addressed to HQDA (DASG-PPM-NC), 5109 Leesburg Pike, Falls Church, VA 22041-3258.

c. The MSDSs must be available in an organized manner where the needed information can be retrieved by employees in an emergency situation.

Section 2 - Mustard Agent Medical Surveillance Program.

2-1. Introduction

a. The mustard agent medical surveillance program is part of a comprehensive occupational and environmental health program that preserves health and prevents work-related disease. Medical surveillance may be defined as the ongoing, systematic, evaluation of employees at risk of exposure to achieve early recognition and prevention of clinical disease. The mustard agent medical surveillance program is part of a larger hazard-specific medical surveillance program,

which includes other chemical, physical, and biological hazards that have been included by the industrial hygienist on a current inventory of occupational health hazards. When conducting a mustard agent medical surveillance examination, the CMA should also consult the health hazard inventory or industrial hygienist to determine what (if any) other exposures have occurred (or are likely to occur) at or above the action levels established for each chemical or physical hazard. Based on this information, the CMA determines the appropriate medical surveillance questions or test and examination elements for those exposure hazards.

b. The CMA establishes the mustard agent medical surveillance program for personnel with a significant exposure potential to mustard agents (see Section 3) and assures that employees assigned to one of four medical surveillance categories (A, B, C, or D) by the certifying officials have been enrolled in the mustard agent medical surveillance program. Personnel with a high risk of mustard agent exposure (that is, Category A) will receive the most extensive examinations. Table 2-1 presents the mustard agent category-specific medical surveillance requirements.

c. Section 4 provides the information on the diagnosis and treatment of mustard agent intoxication.

d. Mustard agent is to be treated as a known carcinogen with the same precautions to personnel exposure. The CMA is to coordinate efforts to prevent mustard exposure with Industrial Hygiene and Safety and to advise command that the amount of mustard agent exposure to contribute to cancer is unknown.

2-2. Mustard agent medical surveillance categories

The installation certifying official recommends medical surveillance category assignments for all personnel with a mustard agent exposure potential to the CMA, based upon the employees' activities in mustard agent operating areas. This assignment can be found on the chemical duty position roster.

a. Category A includes personnel—

(1) With a high mustard agent exposure potential due to the nature of the agent operations being conducted.

(2) Who may be routinely required (that is, on the average, once a week or four times per month) to make entries or to work for prolonged periods in areas with high concentrations of mustard agent (that is, greater than the WPL). These areas also require the use of a self-contained breathing apparatus or a combination airline respirator with an auxiliary self-contained air supply, along with the appropriate dermal protective ensemble. Areas with an unknown agent concentration value will be considered IDLH until monitoring proves different.

b. Category B includes personnel with—

(1) A lower mustard agent exposure potential. These individuals are infrequently required (that is, less than once a week) to make entries or to work for prolonged periods in areas with high concentrations of mustard agents (that is, greater than the WPL), but may have periodic activities that require work in mustard agent concentrations but below the WPL. Examples of such activities might include (but are not limited to)—

(a) Hotline or decontamination activities. (See DA Pam 385-61.)

(b) Air-monitoring technician or 3X placed in closed-container monitoring activities.

(c) Maintenance or surveillance operations conducted in mustard agent storage or disposal facilities.

(d) Demilitarization protective ensemble (DPE) stand-by activities.

- (e) Chemical accident/incident response by initial response force members.
- (2) Job requirements involving the wearing of air-purifying or atmosphere-supplying respirators and dermal protective ensembles during mustard agent training, emergency response exercises, or other related duties.
- c. Category C includes personnel—
 - (1) With minimal probability of exposure to mustard agents except under accident conditions, but whose activities may place them periodically in close proximity to mustard agent operating areas.
 - (2) Who would not be engaged in activities where concentrations of mustard agent would exceed the WPLs and would likely be required to wear respiratory protective equipment only for emergency egress.
 - (3) Laboratory personnel working with neat toxic chemical agents.
- d. Category D includes—
 - (1) Transient visitors to mustard agent operating areas where there is an extremely limited exposure potential. An example of this visitor would be personnel required to observe, review or inspect activities within a chemical limited area or chemical exclusion area (in storage or disposal facilities) where the use of engineering controls does not completely preclude the risk of accidental exposure. (NOTE: Casual visitors receiving familiarization or orientation tours through facilities where mustard agent operations are not ongoing or where exposures have been precluded by engineering controls NEED NOT be assigned to category D.)
 - (2) Laboratory personnel working with research, development, test and evaluation dilute solutions of mustard agents.

2-3. Medical surveillance examinations

Four examinations may be conducted as part of the mustard agent medical surveillance program. These include post-offer, pre-placement; periodic job-related; and termination, as well as post exposure and potential exposure evaluations.

2-4. Post-offer, pre-placement examinations

- a. All personnel assigned to work in areas with a mustard agent exposure potential shall receive a post-offer, pre-placement medical surveillance examination to—
 - (1) Document that the employee—
 - (a) Does not exhibit physical, mental, or emotional impairments that may result in a higher vulnerability to mustard agent exposure.
 - (b) Is physically and mentally able to wear and use the required PPE.
 - (2) Establish the employee's baseline health status, particularly for organ systems that may be affected by exposure to mustard agents.
 - (3) Assess the employee's functional capacity to perform specific work-related tasks.
 - (4) Identify any medical conditions for which recommended work restrictions, limitations, or reasonable accommodations are appropriate under the provisions of 29 CFR 1630.
- b. This examination should be performed by or under the supervision of the CMA and at no cost to the employee. See Section 3, section I for the examination's requirements by medical surveillance category.
- c. An acceptable post offer, pre-placement examination is any medical examination that is--
 - (1) Conducted within 90 days prior to work assignment to an area involving the potential exposure to mustard agents. If this examination was not conducted specifically as a post offer,

pre-placement examination, the CMA should review the examination results and render a written opinion in the medical record as to its acceptability as a post offer, pre-placement examination.

(2) Consistent with the requirements outlined in paragraphs 3-1- through 3-4. If the examination does not include all of the requirements, the CMA should perform the procedures that were omitted.

2-5. Periodic job-related examinations

a. The installation commander or chemical activity commander assures that all personnel assigned to work in areas with an exposure potential to mustard agents receive the appropriate periodic job-related examinations. Paragraphs 3-5 through 3-8 detail the periodic examination requirements by medical surveillance category. The CMA performs the appropriate category-specific, periodic examination and informs the certifying official of those individuals who do not have current periodic examinations.

b. Periodic job-related examinations are—

(1) Usually performed on an annual basis.

(2) Conducted to document any change in the employee's health status, particularly with respect to specific exposure hazards encountered in the workplace over the intervening year.

(3) Designed to screen for mustard agent exposure effects and to assess the employee's physical capacity to perform essential job functions. Using the data gathered from these examinations, the CMA may discover correlations between workplace exposures to mustard agents and specific health endpoints by comparing the employee to—

(a) Himself or herself over time.

(b) Groups of workers with greater or lesser degrees of exposure.

2-6. Termination examinations

a. The CMA performs a termination examination on individuals within 30 days before or after removal from the mustard agent medical surveillance program. The examination documents the employee's health status at the time of termination, particularly for organ systems that may have been affected by mustard agent exposure. Paragraphs 3-9 through 3-11 detail the termination examination requirements by medical surveillance category.

b. Termination examinations do not have to be conducted on individuals who have been enrolled in the mustard agent medical surveillance program for three months or less, unless—

(1) Documented evidence of exposure to mustard agents (that is, clinical signs or symptoms consistent with a mustard agent exposure effect) exists.

(2) A potential exposure evaluation has been conducted within the three-month time period.

c. The installation commander or chemical activity commander ensures that a termination examination has been administered or offered to workers who—

(1) Have been enrolled in the mustard agent medical surveillance program for more than three months.

(2) Have been permanently disqualified or administratively terminated from the chemical personnel reliability program (PRP) and who no longer have mustard agent exposure potential. (See AR 50-6, paragraph 2-21.)

2-7. Post exposure and potential exposure evaluations

This pamphlet requires medical evaluations be performed in the event of accidental exposure or potential exposure to mustard agents. In the past, the criteria used to identify potential exposures

have varied between chemical weapon storage and disposal sites. This variability has led to different implementation criteria for event-driven medical examinations. If an individual has been potentially exposed (see Section 5), the CMA will--

- a. Obtain information concerning the circumstances of the exposure or potential exposure and provide the appropriate medical examinations and emergency treatment as needed (see Appendix, Section II).
- b. Document in the medical record the results of the examination and an opinion as to whether a mustard agent exposure (see glossary) has occurred.
- c. Record any air-monitoring measurements in the medical record (see para 3-1b(2)). See Appendix, Section II, for the content of a mustard agent exposure and potential exposure evaluation.

2-8. Documentation of medical opinions

The CMA records a written opinion in the medical record for each medical examination. This opinion includes—

- a. The results of the medical examination and testing.
- b. A statement about any detected medical condition that would place the individual's health at an increased risk of impairment if exposed to mustard agents.
- c. Any recommended limitations on the potential exposure to mustard agents or on the use of PPE.
- d. A statement that the employee has been informed of the above.

Table 2-1
Category specific medical surveillance¹

Category	Post-offer, pre-placement	Periodic²	Termination
A	Occupational history (OH) Medical history (MH) Physical examination (PE) Electrocardiogram (EKG) PPE evaluation (includes spirometry) Audiometric examination Visual acuity Pupillary reactivity Chest x-ray Complete blood count (CBC) with differential (diff)	Interval OH Interval MH PE EKG (every 5 years) PPE evaluation (spirometry every 2 years) Visual acuity Pupillary reactivity CBC with diff (every 2 years) Audiometric exam	Interval OH Interval MH PE Spirometry Chest x-ray CBC with diff
B	Same as category A	Same as category A, except spirometry and CBC are done every 5 years or more. Frequency at discretion of the CMA or contract medical director	Same as category A
C	OH MH Respirator questionnaire as required ³	Interval OH/MH Respirator questionnaire as required ³	Interval OH/MH Respirator questionnaire as required ³
D	Respirator questionnaire as required ³	Respirator questionnaire as required ³	Respirator questionnaire as required ³

¹See Section 3 for detailed guidance.

²Denotes annual requirement, unless otherwise mentioned.

³Category C and D employees entering mustard agent operating areas may be issued military respirators or emergency escape devices for emergency egress. Under provisions of 29 CFR 1910.134 all individuals issued respiratory protection must be medically evaluated to ensure that they are physiologically and psychologically able to wear the respirators for the intended tasks. Respirator clearance evaluations should be added to the scope of the mustard agent medical surveillance examination under these circumstances. See Appendix for the Occupational Safety and Health Administration (OSHA) Respirator Questionnaire and Medical Clearance Form.

Section 3 - Medical Surveillance Program for Personnel with a Significant Exposure Potential to Mustard Agents.

3-1. Post-Offer, Pre-Placement Examinations for Categories A and B Personnel

The CMA—

a. Obtains a comprehensive—

(1) Occupational history, with specific emphasis on prior potential exposures to skin contact irritants (for example, petroleum distillates, coal tar solvents, chlorinated hydrocarbons, alcohols, glycols, ketones or acetates) or contact allergens (such as, nickel, chromate, epoxy resins, phenolic resins, rubber antioxidants or accelerators, biocides, organic dyes or amines). Inquire as to any past exposures to—

(a) Alkylating agents.

(b) Eye, nose or sinus irritants.

(c) Pulmonary intoxicants.

(d) Developmental toxins.

(e) Chemicals associated with peripheral or central nervous system (CNS) effects.

(2) Medical history and review of systems, to include the OSHA Respirator Questionnaire or equivalent (see Appendix), focusing on the skin, eyes, nose/throat, pulmonary, cardiovascular, neurologic and reproductive systems.

b. Administers a general PE—

(1) With emphasis on the identification of any work-limiting conditions requiring reasonable accommodations or work restrictions, particularly with regard to having the ability to wear PPE.

(2) To detect any significant abnormalities in visual acuity or hearing or abnormalities of the skin or cardiovascular, pulmonary or neurologic systems, which might make the individual more susceptible to the effects of mustard agents.

c. Performs specific evaluations to include a (an)—

(1) Electrocardiogram at rest. At the discretion of the CMA, an individual may obtain an exercise tolerance test (that is, stress EKG) if the individual is to perform strenuous activities using PPE.

(2) Evaluation of the individual's physical ability to perform work involving potential exposure to mustard agents using the required dermal and respiratory protective ensembles (PPE). This evaluation uses reliable evidence such as history (for example, recent successful completion of a mask confidence exercise) or observations (for example, a use test) that show the individual can safely and effectively use the required PPE and that no physiological or psychological conditions impair the individual's ability to use this equipment. For this evaluation, document this evidence and the written medical opinion of the individual's ability to use such equipment in the individual's medical record.

(a) In addition to reviewing the worker's responses to the OSHA Respirator Questionnaire, the CMA must document baseline pulmonary function tests including, as a minimum, the forced vital capacity and the 1-second forced expiratory volume. (See TB MED 509.) Abnormal pulmonary function tests alone are not grounds for disqualification. If there are abnormal pulmonary function tests, consider the following before disqualifying an individual from respiratory PPE use: The individual's medical history (MH) and age; the nature of the work to be performed while wearing respiratory PPE; the type of respiratory PPE employed; the results of the tests of cardiovascular status; and if necessary, a use test.

(b) The CMA must inform the certifying official, in a confidential manner, about any individual in the chemical PRP who appears to be physically or psychologically unable to wear dermal or respiratory protective ensembles (See AR 50-6, para 2-8e.) If work practices require activities to be performed in full protective clothing (that is, air-purifying or atmosphere-supplying respirators with an encapsulating protective ensemble), document the individual's ability to withstand heat stress in the medical record and enroll the individual in a heat stress prevention program.

(3) Audiometric examination to determine the individual's auditory acuity per DA PAM 40-501.

(4) Determination of the near and distant visual acuity and pupillary reactivity.

(a) All individuals will have corrected near and distant visual acuity of 20/40 or better in at least one eye. If corrective lenses are required to provide this acuity, order the lenses before the individual's placement in the workplace.

(b) Provide individuals working in eye hazardous areas or jobs with appropriate protective eyewear (see DA PAM 40-506), to include, but not limited to, prescription and plano-industrial safety glasses and chemical splash goggles.

(c) Instruct individuals on the importance of wearing eyewear and the proper use of these items (whether protective or merely to correct visual acuity), including optical inserts for the protective mask (if required).

(5) Other clinical tests include a 14- by 17-inch posterior-anterior chest radiograph and a CBC with differential white cell count.

3-2. Post-Offer, Pre-Placement Examinations for Category C Personnel

a. No post-offer, pre-placement examination is required; however, the CMA should obtain a comprehensive OH with specific emphasis on prior potential exposures to skin contact irritants and allergens.

b. The CMA should also obtain a MH and a review of systems, focusing on the skin and eyes, cardiovascular, pulmonary, neurologic and psychiatric systems.

c. If the individual may be issued a military respirator or emergency escape device for emergency egress, the individual will complete the OSHA Respirator Questionnaire provided in Appendix, and the CMA should render and document a medical opinion as to the individual's ability to safely wear a respirator for emergency egress purposes.

3-3. Post-Offer, Pre-Placement Examinations for Category D Personnel

a. No post-offer, pre-placement examination is necessary. However, if a respirator or emergency-escape device is to be issued to the worker for emergency egress purposes, the individual will complete the OSHA Respirator Questionnaire contained in Appendix.

b. The CMA will make the determination if the individual is medically fit to carry out assigned duties.

3-4. Post-Offer, Pre-Placement Examinations - Abnormal Findings

In the event of abnormal findings on the post-offer, pre-placement examination, the CMA—

a. Determines what (if any) functional activity or PPE limitations are necessary to protect the health of the worker.

b. Discusses limitations with the worker after reviewing the worker's job description.

c. Informs the worker's supervisor of any work restrictions or reasonable accommodations that might be necessary to protect the health of the worker or to allow him or her to accomplish the essential functions of their job.

d. Informs the certifying official in a confidential manner of any potentially disqualifying information if the worker is in the chemical PRP, along with the appropriate recommendation for restriction or disqualification. (See AR 50-6, para 2-15a(4).)

3-5. Periodic Job-Related Examinations for Categories A and B Personnel

a. All workers in Categories A and B will receive an annual job-related examination to determine continued fitness and to review occupational exposure histories during the preceding year.

(1) Pay special attention to the possibility of non-occupationally related exposures to other substances producing effects similar to mustard agent effects, such as skin contact irritants and allergens.

(2) Obtain a complete MH of signs, symptoms, or adverse effects that may be connected to mustard agent exposure, heat stress, or continued use of PPE.

b. As a minimum, the CMA will review and update the occupational and medical histories, in addition to the examinations listed in paragraphs 3-1b and 3-1c(1) through (4). The one exception is that EKGs are required only once every five years.

(1) Spirometry results and complete blood count (CBC) with differential are obtained every 2 years for category A personnel and every 5 years for category B personnel.

(2) The tests in Table 2-1 should supplement other hazard-specific medical surveillance tests indicated by worker exposures (if any) to substances other than mustard agents that are listed on the health hazard inventory. (See AR 40-5, para 5-9a.)

3-6. Periodic Job-Related Examinations for Category C Personnel

For workers designated in Category C, the CMA will take an interval work history, MH and review of systems, focusing on any signs, symptoms, or adverse effects that may be connected to exposure to mustard agents or other skin contact irritants or allergens. A periodic/annual job-related examination is not necessary. Instruct individuals who continue to wear respirators for emergency egress purposes to complete the OSHA Respirator Questionnaire. (See Appendix.) The mustard agent examination's content should supplement other hazard-specific medical surveillance tests indicated by worker exposures (if any) to substances other than mustard agent that are listed on the health hazard inventory (see AR 40-5, para 5-9a).

3-7. Periodic Job-Related Examinations for Category D Personnel

a. A periodic job-related examination is not required. If a respirator clearance is required, the individual should complete the OSHA Respirator Clearance Form contained in Appendix.

b. The CMA may request a pulmonary function test (PFT) or other diagnostic evaluations periodically at their decision.

c. The CMA will make the determination if the individual is medically fit to carry out assigned duties.

3-8. Periodic Job-Related Examinations - Abnormal Findings

In the event of abnormal findings on the periodic job-related examination, the CMA—

- a. Determines what (if any) functional activity or PPE limitations are necessary to protect the health of the worker.
- b. Discusses the limitations with the worker after reviewing the worker's job description.
- c. Informs the worker's supervisor of any work limitations or reasonable accommodations that will be needed to protect the health of the worker or to allow him or her to accomplish the essential functions of the job.
- d. Informs the certifying official in a confidential manner of any potentially disqualifying information, along with the appropriate recommendation for restriction or disqualification if the worker is in the chemical PRP.

3-9. Termination Examinations for Categories A and B Personnel

The CMA will update the occupational exposure history and medical review of systems as previously described in paragraph 3-5. If as a result of any of the previous examinations, the individual was referred for specialty consultation, the CMA should refer the individual again for follow-up evaluation. A termination physical examination (PE), spirometry, chest radiograph, and CBC with differential white cell count should be obtained.

3-10. Termination Examinations for Category C Personnel

The CMA will update the occupational exposure history and medical review of systems as previously described in paragraph 3-6. A termination examination is not needed before termination of employment.

3-11. Termination Examinations for Category D Personnel

A termination examination is not required unless the individual was in Category A, B, or C at any time during employment.

3-12. Post Exposure and Potential Exposures - Evaluation of Workers with Skin Erythema and Blisters in the Setting of Potential Exposure to Mustard Agents in the Workplace

In a occupational health setting where the patient presents with characteristic skin redness followed by blistering after work activities in a mustard agent operating area, the CMA or contract medical director should consider obtaining urine samples for detection of thiodiglycol as described in TB MED 296. Blood assays for thiodiglycol and tissue specimens for histopathology or detection of deoxyribonucleic acid (DNA) adducts may also be helpful in confirming the clinical diagnosis of sulfur mustard exposure.

- a. The collection of urine samples needs to be done under close supervision by a healthcare provider to preclude the possibility of sample tampering. Clean urine cups should be provided for the collection. Immediately transfer 30 milliliters of urine to a plastic sample tube or container. Leave enough air space in the container to allow for the expansion of liquid contents in the frozen state. Sample containers made of non-breakable plastic, which can withstand cryogenic temperatures, need to be used during shipping. The urine should be collected immediately following suspected exposure. If possible, two additional urine specimens, with 30-milliliter aliquots, need to be obtained one (1) day, two (2) days, three (3) days, and seven (7) days after exposure. The clinic should also provide a 30-milliliter urine sample obtained from a known unexposed individual to serve as a control.
- b. At least 2 cubic centimeters of blood should be drawn into a vacutainer containing ethylenediaminetetraacetic acid as an anticoagulant. Blood samples need to be kept refrigerated

and shipped with adequate ice packs. When only small, limited skin contact with mustard agent occurs, it is very difficult to detect the presence of metabolites in blood or urine specimens. The excised skin of the blister or a small 3 to 5-millimeter punch biopsy of the exposed area will greatly enhance the chance of positive identification.

c. Immediately freeze the skin sample without any preservative in a clean, sealed tube. A tamper proof strip with the patient's name, social security number, and the time and date of collection should be placed across each tube or container with the patient's initials. A memorandum needs to be included with the specimens, providing information on the time of suspected exposure, onset time of symptoms/signs (if any), time sample taken, possible mustard agents involved, patient's age and gender, name of person collecting sample, as well as the CMA or contract medical director's name, address, and phone number. All sealed containers need to be shipped in dry ice by overnight delivery to the U.S. Army Medical Research Institute of Chemical Defense, ATTN: MCMR-UV-PA, Applied Pharmacology Branch, 3100 Ricketts Point Road, APG, MD 21010-5400. If immediate shipment is not possible, urine, blood and tissue specimens need to be kept frozen.

Section 4 - Diagnosis and Treatment of Mustard Agent Intoxication.

4-1. General

In an occupational health setting where the patient presents with characteristic skin redness followed by blistering after work activities in a mustard agent operating area, the CMA should consider obtaining urine samples for detection of thiodiglycol as described in TB MED 296, Chapter 2. Blood assays for thiodiglycol and tissue specimens for histopathology or detection of DNA adducts may also be helpful in confirming the clinical diagnosis of sulfur mustard exposure.

4-2. Routes of entry

The routes of entry are through eye/skin contact, inhalation, or ingestion.

a. Mustard agents are oily liquids with the consistency of motor oil; these agents exhibit low volatility under temperate conditions. Sulfur mustard has the odor of mustard, wild onions, garlic or horseradish, which may be detected by the human nose at concentrations as low as 2 to 10 mg/m³. The vapor density of sulfur mustard is 5.4 times that of air; mustard vapors will normally be found near the ground or floor following a release into undisturbed air.

b. Liquid mustard is somewhat heavier than water, although droplets may remain on the surface of water. Mustard agents are relatively insoluble in water; however, once they go into solution, they are hydrolyzed rapidly. Sulfur mustard is extremely soluble in fats and lipids and will penetrate intact skin within several minutes. Warm, moist intertriginous areas, where the skin temperature and relative humidity are high, and the eyes are particularly susceptible to mustard penetration and biologic effects.

c. Sulfur mustard is considered a persistent chemical agent, in that it will remain on contaminated surfaces for long periods of time under cool temperatures; distilled mustard freezes at 57° Fahrenheit (F). However, the volatility of sulfur mustard is intermediate between that of GB and VX, and at warmer temperatures (above 80° F), sulfur mustard may exhibit a significant

vapor pressure. For all of these reasons, sulfur mustard should be considered hazardous by either vapor inhalation or by vapor/liquid contact with the skin and mucous membranes.

4-3. Toxicology

- a. Mustard is a vesicant. Besides cutaneous redness and vesication, it—
 - (1) Produces eye injuries and damage to the respiratory tract.
 - (2) May be absorbed systemically and cause damage to organ systems with rapidly growing cells that are remote from the site of absorption.
- b. The principal cause of injury is the alkylating effect of mustard. The two side chains of sulfur mustard, in the presence of a polar solvent (for example, water), cyclize and become biologically very active. These two chains can attach to two other molecules and specifically bind to the guanine nitrogen in DNA strands, causing cross-linking of DNA and eventually cellular death. Because of the effects on DNA, cell lines with rapid turnover are most affected by the systemic uptake of mustard (for example, the bone marrow and gastrointestinal (GI) tract). Skin sensitization occurs, so individuals with a previous mustard exposure may be affected to a greater degree upon a second exposure.
- c. The rate of detoxification of mustard in the human body is slow. Hence, repeated small exposures may have a cumulative effect.
- d. Eye absorption results in injuries ranging from mild conjunctivitis to corneal necrosis and opacification. Infection of the ocular lesions is common.
- e. Skin absorption of mustard vapor results initially in capillary hyperemia and dermal edema, usually followed by vesication. Skin contact with liquid mustard produces a more marked reaction, often yielding an area of tissue necrosis without vesication, surrounded by an area of erythema and blisters. The skin effects of mustard agent are dependent on the concentration of the agent and the environmental conditions; a hot, humid atmosphere promotes the most severe reactions.
- f. Inhalation of mustard causes damage primarily to the nasopharyngeal, laryngeal and tracheobronchial mucosa. Moderate exposure results in hyperemia and necrosis of the respiratory mucosa. More severe exposures yield congestion of the pulmonary parenchyma, edema, and atelectasis. Suppurative bronchitis or bronchopneumonia frequently complicates pulmonary lesions and may be the primary cause of death from vapor exposures. Repeated exposures or prolonged inhalation can cause bronchiectasis or chronic bronchitis.
- g. If ingestion of mustard occurs, either directly or from liquid-contaminated food or drink, necrosis and desquamation of GI mucosa occurs, producing diarrhea, GI hemorrhage, nausea, and vomiting.
- h. Systemic effects can occur after any exposure with much individual variation. Like other alkylating agents, systemic absorption results in injury to the bone marrow, lymph nodes, and spleen producing leukopenia and thrombocytopenia. Other systemic effects include—
 - (1) Fever.
 - (2) CNS depression.
 - (3) Parasympathomimetic effects (bradycardia or cardiac irregularities).
 - (4) Hemoconcentration.
 - (5) Shock.
- i. In addition to its direct cytotoxic effects, mustard has also been shown to be mutagenic and carcinogenic in animals. Prolonged human exposure has been associated with cancer of the tongue, paranasal sinus, larynx, bronchus, lung, and mediastinum. Tumors observed have been

of the squamous or undifferentiated cell types. Consider the possibility of skin cancer because of the frequency of this lesion in animal studies.

j. Since sulfur mustard agent is similar in its effects to nitrogen mustard, which has been associated with human leukemia, this disease might also be expected to occur in humans chronically exposed to mustard.

4-4. Signs and symptoms

a. The acute signs and symptoms following mustard exposure are not immediate—they are delayed in appearance. The duration of the latent period and the degree of injury are both dependent on the severity of the exposure as well as the organs affected. The delay of onset is typically 4 to 6 hours but may range from less than 1 hour up to several days.

b. The eye is the most sensitive organ system and may become inflamed at mustard concentrations, which do not affect the skin or respiratory tract significantly. Mustard agent conjunctivitis may be present with lacrimation, grittiness in the eye, and erythema of the lids and conjunctiva. More severe exposures may produce—

- (1) Photophobia.
- (2) Blepharospasm.
- (3) Pain.
- (4) Corneal erosions.
- (5) Iritis.
- (6) Conjunctival vascularization.
- (7) Ulceration.
- (8) Corneal opacification.

c. Skin exposure to mustard vapor is marked by the delayed appearance of erythema and edema, later followed by the development of vesication or blisters. Itching and burning may occur during the erythematous phase. Multiple small vesicles arise in the erythematous skin and gradually enlarge and coalesce to form typical large, fragile, yellowish bullae. These are usually painless. Liquid mustard contamination of the skin may result in an area of gray-white necrotic skin surrounded by erythema and vesication.

d. Respiratory effects of mustard occur as a result of vapor or aerosol exposures, with the onset time and intensity related to the degree of exposure. The airway injury associated with mustard exposure involves inflammation of the respiratory mucosa in the upper and lower airways. This damage begins in the upper airways and descends to the lower airways in a dose-dependent manner. Upper airway problems include damage to the epithelial lining of the nose, sinuses, pharynx, larynx, trachea, and bronchi. Usually, the terminal bronchioles and alveoli are affected only after a very large inhalation exposure; this is usually a pre-terminal event. Severe exposure leads to deeper damage involving the connective tissue and smooth muscle of the airways. Early changes to the epithelium include congestion with edema, hyperemia, and petechial hemorrhages, followed by necrosis, and later sloughing of the mucosa with more severe exposures. During the later reparative stages, metaplastic stratified squamous epithelium covers the damaged surfaces.

e. Central airway involvement with mucosal inflammation and necrosis may progress to pseudomembrane formation. These membranes, much like those seen with diphtheria, may peel off and obstruct more peripheral airways. Bronchoscopy may be necessary for removal of the sloughed membranes. Small airway and/or central airway inflammation will lead to a severe hacking cough with prominent dyspnea.

f. After the initial inhalation of mustard, damage to lung tissue leads to congestion, edema, and in severe cases, a chemical pneumonia over the first 24 to 48 hours. These changes are accompanied by an increase in the white blood cell (WBC) count, a mild temperature elevation, and pulmonary infiltrates. Some 2 to 4 days later, signs of bacterial infection may occur, with a higher WBC count, a shift in the differential, new infiltrates, and a change in sputum production with purulence. There may also be areas of airway collapse in severe cases.

g. Gastrointestinal effects of intense mustard exposures include nausea and vomiting. These effects are thought to be in part cholinergic. There may be some added effect of mustard swallowed from ingested, contaminated water (for example, the sailors in Bari Harbor) or from swallowed tracheal secretions, which have trapped some mustard.

h. Central Nervous System (CNS) effects are occasionally seen with fatigue, depression, anxiety, and agitation. It is difficult to separate CNS effects from mustard exposure versus the post-traumatic stress syndrome.

i. As an alkylating agent, sulfur mustard may have potent bone marrow effects. There is an initial leukocytosis followed by progressive effects on rapidly proliferating cells of the hematopoietic system. Leukopenia begins to appear at 3 to 5 days post-exposure with WBC count approaching zero by 7 to 10 days for severely exposed individuals. Systemic absorption of mustard may be sufficient to create a profound leukopenia with associated sepsis/pneumonitis and death. A leukopenia of less than 200 WBCs per cubic millimeter is a bad prognostic sign. Death from pneumonitis usually occurs at 8 to 10 days with some scattered cases up to 2 to 3 weeks.

j. Chronic mustard-induced illness is most commonly referable to the eyes, skin, respiratory tract, or bone marrow.

(1) Delayed, recurrent keratoconjunctivitis of the eyes has been documented in some cases as long as 45 years after the original exposure.

(2) Healing of mustard blisters may result in skin exfoliation and may leave residual areas of hypo- or hyperpigmentation; rarely, there may be residual scarring in places where deeper burns have occurred or where skin grafting was attempted prematurely.

(3) Dyspnea, productive cough, loss of exercise tolerance, frequent pulmonary infections, chronic bronchitis, bronchiectasis, and changes in pulmonary function tests may indicate possible mustard-induced chronic lung disease.

(4) The development of leukoplakia, masses, or ulcerations that fail to heal on the skin or in the upper respiratory tract may indicate carcinoma. Other respiratory tract symptoms, such as chest pain, dyspnea, cough, hemoptysis, or hoarseness, could also suggest a respiratory tract malignancy.

(5) Findings consistent with leukemia may also occur. These include lymph node enlargement, purpura, anemia, weakness, fever, frequent infections, splenomegaly, and leukopenia. (NOTE: The latent period for mustard-induced carcinoma or leukemia is likely to be twenty years or greater following exposure.)

4-5. Diagnosis and treatment

a. The diagnosis of sulfur mustard exposure in the workplace is primarily a clinical exercise, based upon the history of exposure, clinical signs, symptoms, and the time course between exposure and onset of symptoms. Confirmatory tests, such as the urinary thiodiglycol assay, may be helpful if they are positive. However, this assay may be non-diagnostic for very mild dermal exposures and has never been used to confirm purely inhalational exposures. When a

patient presents with erythema and blisters, it is important to rule out other items in the differential diagnosis, such as—

- (1) Delayed hypersensitivity (type intravenously) allergic contact dermatitis.
- (2) Contact irritation.
- (3) Contact urticaria syndrome.

b. The urinary thiodiglycol assay may be very helpful, particularly for dermal exposures resulting in erythema or vesication affecting greater than 1 percent of the body surface area. Mustard is hydrolyzed and metabolized to thiodiglycol in the body and excreted in the urine. The immediate collection of urine followed by the collection of urine specimens on days 1, 2, 3 and 7 following exposure will allow the clinician to quantify the amount of thiodiglycol excreted, its half-life in the body, and excretion kinetics. Generally, urinary thiodiglycol excretion peaks 48 to 72 hours after exposure, with a first order half-life of elimination of between 1 and 1.5 days. This assay is very specific for sulfur mustard, but requires specialized gas chromatography/mass spectrometry (see TB MED 296, Chapter 2). Decontamination.

c. Decontamination of mustard-exposed casualties, either vapor or liquid, should be accomplished in the field or the demilitarization facility within the first two minutes following exposure to prevent cellular damage. If not accomplished within the first several minutes, decontamination should still be performed to ensure any residual liquid mustard is removed from the skin or clothes or to ensure any trapped mustard vapor is removed with the clothing. Removing trapped mustard vapor will prevent vapor off-gassing or subsequent cross-contamination of other healthcare providers or the healthcare facility. Physical removal of the mustard agent, rather than detoxification or neutralization, is the most important principle in patient decontamination. Mustard is not detoxified by water alone and will remain in decontamination effluent (in dilute concentrations) if hydrolysis has not taken place.

(1) Vapor-exposed casualties should be decontaminated by removing all clothing in a clean air environment and shampooing or rinsing the hair to prevent vapor off-gassing.

(2) Liquid-exposed casualties should be decontaminated by—

(a) Washing in warm or hot water at least three times. Use liquid soap (dispose of container after use and replace), copious amounts of water, and mild to moderate friction with a single-use sponge or washcloth in the first and second washes. Always wash from areas of lesser contamination to areas of greater contamination. Scrubbing of exposed skin with a brush is discouraged, because skin damage may occur which may enhance absorption. The third wash should be a rinse with copious amounts of warm or hot water. Shampoo can be used to wash the hair. The rapid physical removal of a chemical agent is essential. If warm or hot water is not available, but cold water is, use cold water. Do not delay decontamination to obtain warm water.

(b) Rinsing the eyes, mucous membranes, or open wounds with copious amounts of sterile saline or water.

(3) The healthcare provider should—

(a) Check the casualty after the three washes to verify adequate decontamination (i.e., less than 1 WPL--the workplace airborne exposure limit) before allowing entry to the treatment area within the military or contractor-operated medical treatment facility. This may be done using a low level air monitoring device such as ACAMS or MINICAMS to detect any evidence of vapor off-gassing.

(b) Be prepared to stabilize conventional injuries during the decontamination process. Careful decontamination can be a time consuming process. The health care provider may have to enter the contaminated area to treat the casualty during this process. In industrial operations,

such as demilitarization plants, the proximity of medical support allows medical personnel to arrive at the injury site early in the decontamination process. In this case, medical personnel should don proper PPE and evaluate the exposed workers. This will allow for early diagnosis and treatment if required and will facilitate psychological support to the worker.

d. Erythema may appear as early as 2 or as late as 24 to 48 hours after exposure, depending on the intensity of exposure. For mild erythema, no treatment is usually needed. It is much like mild sunburn with the same recovery time. The objective is to prevent secondary infection. More marked erythema with associated pain and itching needs treatment much as for a moderate to severe second-degree sunburn. Systemic analgesics for pain and antihistamines for itching should be provided for symptomatic relief.

e. Small blisters in non-critical areas should be left intact. If the blister is about to rupture, use a good aseptic technique to drain the blister and cover it lightly with a sterile dressing. Antibiotic ointment, such as silver sulfadiazine, should be applied to larger lesions to prevent infection. The blister fluid itself is not a vesicant. For crops of blisters or large areas of vesication, hospitalization may be required, and frequent, careful debridement of the affected areas is needed. Whirlpool baths may be useful in the routine care of mustard burns. Skin healing may take weeks to months.

f. Unlike thermal burns, chemical burns do not require large amounts of fluid replacement. Do not over hydrate; however, some fluid replacement is needed since the patients frequently do not drink adequate amounts of fluids to stay hydrated.

g. The main goals of eye treatment for mustard exposed victims are to prevent infection, corneal scarring, and loss of vision. Since mustard fixes to tissue within the first 2 minutes after exposure, irrigation of the eyes with saline during this timeframe is helpful in removing any remaining mustard around the eyelids, on the face, or on the eyelashes. In most cases, however, affected individuals will present for medical attention much later than the first 2 minutes following exposure, after developing signs and symptoms of exposure. In these cases, aggressive attempts to pry apart severely painful, blepharospastic eyelids to accomplish irrigation is of questionable value, it may create unnecessary physical and emotional trauma.

h. Early assessment of the patient's visual acuity is important, and a careful examination of the cornea and conjunctivae membranes with a slit lamp (whenever possible) is also important. Early consultation with an ophthalmologist is also advisable.

i. For mild cases of conjunctivitis, use soothing eye drops or eye irrigation 3 to 4 times daily. Antibiotic ophthalmic drops or ointments are also recommended. A mydriatic, such as homatropine, is recommended to keep the pupil dilated and to prevent the development of synechiae. Vaseline on the eyelid margins is recommended to prevent the lid margins from adhering. Topical analgesics may be used for initial clinical evaluation or to obtain a visual acuity, but are not recommended for repeated use since corneal damage may result. Topical steroids may be helpful if used in the first 48 hours following the injury.

j. The treatment of inhalation exposures to sulfur mustard follows the same precepts that are applied to other inhalation injuries. First priority is given to ensuring the establishment of a patent airway and appropriate airway management. Irritation of the nose, sinuses, and throat, as well as hoarseness or a non-productive cough are early symptoms of airway involvement. These symptoms may progress, depending on the degree of mustard exposure. Bronchospasm may follow, especially for those patients with pre-existing reactive airway diseases such as asthma. In such cases, bronchodilators may be of value. Patients with evidence of worsening symptoms need to have their pO_2 and pCO_2 monitored, and their acid-base status followed closely.

k. Laryngospasm and vocal cord edema should be suspected whenever respiratory stridor or hoarseness is present. Under these circumstances, inspection of the vocal cords may be appropriate, followed by endotracheal intubation. Blind nasotracheal intubation is not appropriate in this clinical setting. These patients will need adequate oxygenation since there may be associated lower airway disease that will manifest later. Cool mists, with antitussives and soothing demulcents to relieve coughing and airway irritation are useful.

l. Patients with significant inhalation exposures to sulfur mustard may develop a chemical pneumonitis during the first 24 to 48 hours following exposure. Cultures should be done on the sputum to identify any specific organism(s) before starting antibiotics. The immune status of these patients should be evaluated, since leukopenia may develop secondary to bone marrow depression at about 4 to 5 days after a significant mustard exposure.

m. Severe respiratory distress will require supplemental oxygen and assisted ventilation. Care should be taken when hydrating patients with significant body surface area skin burns. Over-hydration of these patients may result in "third spacing" of fluids within damaged lungs and may worsen ventilation/perfusion mismatches. The initial nausea or vomiting that arises during the first 24 to 48 hours following mustard exposures may be treated with antiemetics. Persistent vomiting and diarrhea may require intravenous fluid replacement and the maintenance of electrolyte balance.

Section 5 - Potential Exposure Evaluation Criteria for Mustard Agent Operations.

5-1. General

This pamphlet requires medical evaluations be performed in the event of accidental exposure or potential exposure to mustard agents. In the past, the criteria used to identify potential exposures have varied between chemical weapon storage and disposal sites. This variability has led to different implementation criteria for event-driven medical evaluations of these patients.

Paragraph 2-7 provided some guidance to the field as to the criteria for conducting potential exposure evaluations during H, HD and HT operations. The criteria for potential exposure evaluations have been developed with input from the field to ensure that medical evaluations of potentially exposed individuals take place whenever the potential for medically significant dermal or respiratory exposure exists.

a. An exposed worker is an individual (working in a mustard agent operating area) who exhibits clinical signs or symptoms of mustard agent intoxication. Confirmation of the clinical diagnosis should be made by looking for the presence of thiodiglycol in the urine, plasma or blister fluid; the presence of DNA adducts in the skin; or the characteristic mustard histopathology on excisional or punch biopsy of affected skin.

b. A potentially exposed worker is an individual who works in a mustard agent operating area where levels of mustard agent either exceed the protective capability of the PPE or are detectable at or above the applicable WPL-AEL, and there is a breach in the PPE or a failure of engineering controls.

5-2. Potential exposure policies

These policies apply to all storage, recovery, disposal (including stockpile and non-stockpile operations), and laboratory facilities.

a. All operational events meeting the potential exposure criteria shall be reported immediately to the installation commander, chemical activity commander, or the site project manager. Any individual meeting the potential exposure criteria shall be sent immediately to the supporting medical facility for a medical evaluation per paragraph 2-8 and Appendix, Section II.

b. Potentially exposed personnel should not be returned to duty in a mustard agent operating area until medically cleared by the CMA or their designee.

5-3. Procedures for determining potential exposures while wearing PPE

Any individual meeting the potential exposure criteria defined below shall be sent immediately to the supporting medical facility for a medical evaluation per paragraph 2-8 and Appendix, Section II. An individual shall be considered potentially exposed:

a. During any entry when mustard agent concentrations exceed the authorized level for the PPE being worn. These levels include:

(1) $\geq 0.02 \text{ mg/m}^3$ for M40 respirators and other air purifying respirators approved by the Office of the Director of Army Safety for chemical agent operations

(2) $\geq 4 \text{ mg/m}^3$ for a self-contained breathing apparatus or combination airline respirator with an auxiliary self-contained breathing apparatus worn with encapsulating ensembles other than the DPE.

(3) $\geq 100 \text{ mg/m}^3$ for DPE entries. (**NOTE:** *The National Institute of Occupational Safety and Health has designated the assigned protection factor of 50 for negative pressure, air purifying respirators and 10,000 for self-contained breathing apparatuses. The limit of 100 mg/m^3 for DPE entries is based upon human volunteer testing conducted in 1976.*)

b. During any entry into a mustard agent operating area where mustard vapor is detectable at or above 0.83 mg/m^3 or liquid contamination is known to exist and where a breach or tear occurs in a DPE, modified Army level A, or other equivalent levels of PPE worn with self-contained breathing apparatus or combination airline respirator with an auxiliary self-contained breathing apparatus. (**NOTE:** *The National Research Council, in their monograph entitled Review of Acute Human Toxicity Estimates for Selected Chemical Warfare Agents, suggest 25 mg-min/m^3 as the threshold effects dose for percutaneous vapor under hot temperatures. Using a 30-minute exposure period as a reasonable worst case for breaches in PPE with atmosphere-supplying respiratory protection being worn, a concentration of 0.83 mg/m^3 is established as the dermal threshold for requiring potential exposure evaluations.*)

c. During any loss of engineering controls, upset conditions, or mishap, which results in an agent concentration of $\geq 0.003 \text{ mg/m}^3$ in areas where the individual was unprotected (that is, no respiratory protection for mustard agents was being worn).

d. During any entry into a mustard agent operating area where an individual develops signs or symptoms consistent with mustard agent exposure effect and where mustard agent vapor is detectable at or above 0.0004 mg/m^3 or liquid contamination is known to exist.

e. During any DPE cut out in an airlock in which the mustard agent concentration is equal to or exceeds 0.02 mg/m^3 and the DPE wearer is switched from the self-contained breathing apparatus backpack to an M40 respirator.

f. During any entry where DPE life support systems air sampling indicates agent concentrations to be $\geq 0.003 \text{ mg/m}^3$.

Appendix
Medical Evaluation of Respirator Wearers and Potential Exposures to Mustard Agents

Section I
The OSHA Respirator Questionnaire

MEDICAL RECORD—SUPPLEMENTAL MEDICAL DATA

For use of this form see AR 40-66; the proponent agency is the Office of The Surgeon General

REPORT TITLE

OTSG APPROVED (Date)

OSHA RESPIRATOR QUESTIONNAIRE

1. Your age (to nearest year):
2. Sex (circle one): Male/Female
3. Your height: ft. in.
4. Your weight: lbs.
5. Your job title:
6. A phone number where you can be reached by the healthcare professional who reviews this questionnaire (include the Area Code):
7. The best time to phone you at this number:
8. Has your employer told you how to contact the healthcare professional who will review this questionnaire (circle one): Yes/No
9. Check the type of respirator you will use (You can check more than one category, if applicable):
- a. N. R. or P disposable respirator (filter-mask, non-cartridge type only).
- b. Other type (for example, half- or full-face piece type, powered-air purifying, supplied-air, self-contained breathing apparatus).
10. Have you worn a respirator (circle one): Yes/No
- If "yes," what type(s):

Part A. Section 2. (Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you currently smoke tobacco or have you smoked tobacco in the last month: Yes/No
2. Have you ever had any of the following conditions:
- a. Seizures (fits): Yes/No
- b. Diabetes (sugar disease): Yes/No
- (continued top of next column)

c. Allergic reactions that interfere with your breathing: Yes/No

d. Claustrophobia (fear of closed-in places): Yes/No

e. Trouble smelling odors: Yes/No

3. Have you ever had any of the following pulmonary or lung problems?

a. Asbestosis: Yes/No

b. Asthma: Yes/No

c. Chronic bronchitis: Yes/No

d. Emphysema: Yes/No

e. Pneumonia: Yes/No

f. Tuberculosis: Yes/No

g. Silicosis: Yes/No

h. Pneumothorax (collapsed lung): Yes/No

i. Lung cancer: Yes/No

j. Broken ribs: Yes/No

k. Any chest injuries or surgeries: Yes/No

1. Any other lung problem that you've been told about: Yes/No

4. Do you currently have any of the following symptoms of pulmonary or lung illness?

a. Shortness of breath: Yes/No

b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes/No

c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes/No

(continued top of next column)

d. Have to stop for breath when walking at your own pace on level ground: Yes/No

e. Shortness of breath when washing or dressing yourself: Yes/No

f. Shortness of breath that interferes with your job: Yes/No

g. Coughing that produces phlegm (thick sputum): Yes/No

h. Coughing that wakes you early in the morning: Yes/No

i. Coughing that occurs mostly when you are lying down: Yes/No

j. Coughing up blood in the last month: Yes/No

k. Wheezing: Yes/No

l. Wheezing that interferes with your job: Yes/No

m. Chest pain when you breath deeply: Yes/No

n. Any other symptoms that you think may be related to lung problems: Yes/No

5. Have you ever had any of the following cardiovascular or heart problems?

a. Heart attack: Yes/No

b. Stroke: Yes/No

c. Angina: Yes/No

d. Heart failure: Yes/No

e. Swelling in your legs or feet (not caused by walking): Yes/No

f. Heart arrhythmia (heart beating irregularly): Yes/No

g. High blood pressure: Yes/No

(Continue on reverse)

PREPARED BY: (Signature & Title)

DEPARTMENT/SERVICE/CLINIC

DATE

PATIENT'S IDENTIFICATION (For typed or written entries give: Name—last, first, middle; grade; date; hospital or medical facility)

☐ HISTORY/PHYSICAL☐ FLOW CHART☐ OTHER EXAMINATION OR EVALUATION☐ OTHER (Specify)☐ DIAGNOSTIC STUDIES☐ TREATMENT

5. Have you ever had any of the following cardiovascular or heart problems? (Cont'd)

h. Any other heart problem that you've been told about: Yes/No

6. Have you ever had any of the following cardiovascular or heart symptoms?

a. Frequent pain or tightness in your chest: Yes/No

b. Pain or tightness in your chest during physical activity: Yes/No

c. Pain or tightness in your chest that interferes with your job: Yes/No

d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No

e. Heartburn or indigestion that is not related to eating: Yes/No

f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No

7. Do you currently take medication for any of the following problems?

a. Breathing or lung problems: Yes/No

b. Heart trouble: Yes/No

c. Blood pressure: Yes/No

d. Seizures (fits): Yes/No

8. If you've used a respirator, have you ever had any of the following problems? (If you've never used a respirator, check the following space and go to question 9:)

a. Eye irritation: Yes/No

b. Skin allergies or rashes: Yes/No

c. Anxiety: Yes/No

d. General weakness or fatigue: Yes/No

e. Any other problem that interferes with your use of a respirator: Yes/No

9. Would you like to talk to the healthcare professional who will review this questionnaire about your answers to this questionnaire: Yes/No

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-face piece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

(continued top of next column)

10. Have you ever lost vision in either eye (temporarily or permanently): Yes/No

11. Do you currently have any of the following vision problems?

a. Wear contact lenses: Yes/No

b. Wear glasses: Yes/No

c. Color blind: Yes/No

d. Any other eye or vision problem: Yes/ No

12. Have you ever had an injury to your ears, including a broken ear drum: Yes/No

13. Do you currently have any of the following hearing problems?

a. Difficulty hearing: Yes/No

b. Wear a hearing aid: Yes/No

c. Any other hearing or ear problem: Yes/ No

14. Have you ever had a back injury: Yes/No

15. Do you currently have any of the following musculoskeletal problems?

a. Weakness in any of your arms, hands, legs, or feet: Yes/No

b. Back pain: Yes/No

c. Difficulty fully moving your arms and legs: Yes/No

d. Pain or stiffness when you lean forward or backward at the waist: Yes/No

e. Difficulty fully moving your head up or down: Yes/No

f. Difficulty fully moving your head side to side: Yes/No

g. Difficulty bending at your knees: Yes/No

h. Difficulty squatting to the ground: Yes/ No

i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Yes/No

j. Any other muscle or skeletal problem that interferes with using a respirator: Yes/No

(continued top of next column)

Part B: Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the healthcare professional who will review the questionnaire.

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: Yes/No

If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: Yes/No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes/No

If "yes," name the chemicals if you know them:

3. Have you ever worked with any of the materials, or under any of the conditions, listed below:

a. Asbestos: Yes/No

b. Silica (e.g., in sandblasting): Yes/No

c. Tungsten/cobalt (e.g., grinding or welding this material): Yes/No

d. Beryllium: Yes/No

e. Aluminum: Yes/No

f. Coal (for example, mining): Yes/No

g. Iron: Yes/No

h. Tin: Yes/No

i. Dusty environments: Yes/No

j. Any other hazardous exposures: Yes/No

If "yes," describe these exposures:

4. List any second jobs or side businesses you have:

5. List your previous occupations:

6. List your current and previous hobbies:

7. Have you been in the military services? Yes/No

If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes/No

8. Have you ever worked on a HAZMAT team? Yes/No

(continued top of next page)

CLINICAL RECORD

Report on S.F. _____
 or
 Continuation of DA 4700 RESPIRATORY MEDICAL QUESTIONNAIRE
(Strike out one line) (Specify type of examination or data)

(Sign and date)

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No

If "yes," name the medications if you know them:

10. Will you be using any of the following items with your respirator(s)?

a. HEPA Filters: Yes/No

b. Canisters (for example, gas masks): Yes/ No

c. Cartridges: Yes/No

11. How often are you expected to use the respirator(s) (circle "yes" or "no" for all answers that apply to you):

a. Escape only (no rescue): Yes/No

b. Emergency rescue only: Yes/No

c. Less than 5 hours per week: Yes/No

d. Less than 2 hours per day: Yes/No

e. 2 to 4 hours per day: Yes/No

f. Over 4 hours per day: Yes/No

12. During the period you are using the respirator(s), is your work effort:

a. Light (less than 200 kcal per hour): Yes/ No

If "yes," how long does this period last during the average shift: hrs. mins.

Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1 - 3 lbs.) or controlling machines.

b. Moderate (200 to 350 kcal per hour): Yes/No

If "yes," how long does this period last during the average shift: hrs. mins.

Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 Lbs) on a level surface.

c. Heavy (above 350 kcal per hour): Yes/ No

If "yes," how long does this period last during the average shift: hrs. mins.

Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working on a loading dock shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 Lbs).

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when you're using your respirator: Yes/No

If "yes," describe this protective clothing and/or equipment:

14. Will you be working under hot conditions (temperature exceeding 77° F: Yes/No

15. Will you be working under humid conditions: Yes/No

16. Describe the work you'll be doing while you're using your respirator(s):

17. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

18. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):

Name of the first toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift

Name of the second toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift:

Name of the third toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift:

The name of any other toxic substances that you'll be exposed to while using your respirator:

(continued top of next column)

(continued top of next column)

Page 3 of 3

(Continue on reverse side)

PATIENT'S IDENTIFICATION *(For typed or written entries give: Name - last, first, middle; grade; date; hospital or medical facility)*

REGISTER NO.

WARD NO.

REPORT ON _____ or CONTINUATION OF DA 4700

Standard Form 507

GENERAL SERVICES ADMINISTRATION AND
 INTERAGENCY COMMITTEE ON MEDICAL RECORDS
 FPMR 101-11.80 6-8
 OCTOBER 1975

507-106

MEDICAL CLEARANCE FOR RESPIRATOR USE

Name _____

Date _____

SS# _____

Date of Birth _____

Sex ____M ____F

Height ____ft ____in Weight ____lbs ____

Job Title _____

Employer _____

Type of Respirator Used (Circle all that apply)

Full-face negative pressure air purifying

Emergency escape device

Powered air-purifying respirator

Other (list) _____

Level of Work Effort (Circle one)

Light

Moderate

Heavy

Strenuous

Extent of Usage

Daily Occasionally Rarely – or for emergency escape purposes

Length of Time of Anticipated Effort in Hours

Special work Considerations (that is, high places, temperature, or protective clothing)

Employer

Representative

Written Recommendation for Use of Respiratory Protective Devices

I have completed a medical evaluation of _____ for the use of the respiratory device(s) listed above and in compliance with 29 CFR 1910.134 effective April 8, 1998. Based upon my evaluation, I find that this individual is/is not able to wear these device(s) in a safe and healthful manner. I have/have not identified the following limitations on the use of these respirator:

In my judgment, this individual does/does not require a follow-up medical examination to make a final determination as to their ability to wear the respiratory protective devices listed above.

The individual named above has been given a copy of this written recommendation and has been advised to request a follow-up medical evaluation if he or she develops medical signs or symptoms, which impair his or her ability to safely use this respiratory protective device as intended.

Printed signature and title of licensed healthcare practitioner

Date

Section II

Potential Exposure Evaluation Data Sheet and Clinical Record Form

<p>DATA SHEETS FOR COLLECTING INFORMATION ON CHEMICAL AGENT EXPOSED OR POTENTIALLY EXPOSED WORKERS</p>
--

1. Name of worker: _____ SYMPTOMATIC? YES NO

If symptomatic, please describe:

2. Chemical Agent Exposure Information:

(CIRCLE THE CORRECT ITEMS)

AGENT:	GB	VX	HD
PHYSICAL STATE:	VAPOR	LIQUID	
POTENTIAL ROUTE:	EYE INHALATION	SKIN	

3. Level of PPE worn

(CIRCLE THE CORRECT ITEMS)

DPE	LEVEL A	LEVEL B	TAPES
MASK	GLOVES	BOOTS	APRON
SLUNG MASK	COVERALLS	IMPREGS	

OTHER: _____

4. Estimated time at which event occurred:

duration of exposure/potential exposure: _____

time elapsed since initial event:

5. Estimated concentration of agent in workplace where exposure occurred:

(IF KNOWN) _____ mg/m³
or
_____ x TWA

6. Was the detection of agent confirmed by a second means of detection?

(CIRCLE THE CORRECT ITEM)

YES NO PENDING

7. Has the exposed or potentially exposed worker:

(CIRCLE THE CORRECT ITEM)

changed and removed clothing:	YES	NO
been showered or decontaminated?	YES	NO
received any treatment?	YES	NO

IF TREATMENT HAS BEEN RECEIVED, PLEASE DESCRIBE:

Information received from:

Name of clinic person recording data:

Date and time information was recorded:

POTENTIAL EXPOSURE EVALUATION CLINICAL RECORD FORM

Date _____ Time _____ PRP Notification ☐

Body Temp _____ Blood Pressure _____ Pulse Rate _____ Respiratory Rate _____

Body Weight _____ lbs

POTENTIAL AGENT GB ☐ VX ☐ H ☐ OTHER ☐

CHIEF COMPLAINT/EXPOSURE HISTORY:

REVIEW OF SYSTEMS

	NO	YES		NO	YES
DIM VISION	<input type="checkbox"/>	<input type="checkbox"/>	RUNNY NOSE	<input type="checkbox"/>	<input type="checkbox"/>
BLURRED VISION	<input type="checkbox"/>	<input type="checkbox"/>	DYSPNEA	<input type="checkbox"/>	<input type="checkbox"/>
EYE PAIN	<input type="checkbox"/>	<input type="checkbox"/>	CHEST TIGHTNESS	<input type="checkbox"/>	<input type="checkbox"/>
HEADACHE	<input type="checkbox"/>	<input type="checkbox"/>	COUGHING	<input type="checkbox"/>	<input type="checkbox"/>
NAUSEA	<input type="checkbox"/>	<input type="checkbox"/>	WHEEZING	<input type="checkbox"/>	<input type="checkbox"/>
VOMITING	<input type="checkbox"/>	<input type="checkbox"/>	SWEATING	<input type="checkbox"/>	<input type="checkbox"/>
DIARRHEA	<input type="checkbox"/>	<input type="checkbox"/>	WEAKNESS	<input type="checkbox"/>	<input type="checkbox"/>
SKIN IRRITATION	<input type="checkbox"/>	<input type="checkbox"/>			

PHYSICAL EXAM

EYE:

	NO	YES (DESCRIBE)
LACRIMATION	<input type="checkbox"/>	<input type="checkbox"/> _____
CONJUNCTIVAL REDNESS	<input type="checkbox"/>	<input type="checkbox"/> _____
BLEPHAROSPASM	<input type="checkbox"/>	<input type="checkbox"/> _____
ABNORMAL PUPIL REACTIVITY	<input type="checkbox"/>	<input type="checkbox"/> _____
PUPIL SIZE	OD _____	millimeters OS _____ millimeters

RESPIRATORY

	NO	YES (DESCRIBE)
STRIDOR	<input type="checkbox"/>	<input type="checkbox"/> _____
WHEEZES	<input type="checkbox"/>	<input type="checkbox"/> _____
RHONCHI	<input type="checkbox"/>	<input type="checkbox"/> _____
RHINORRHEA	<input type="checkbox"/>	<input type="checkbox"/> _____
BRONCHORRHEA	<input type="checkbox"/>	<input type="checkbox"/> _____

SALIVATION ☐ ☐ _____

SKIN

NO YES (DESCRIBE)

SWEATING ☐ ☐ _____

NEUROMUSCULAR

NO YES (DESCRIBE)

FASCICULATIONS ☐ ☐ _____

TWITCHING ☐ ☐ _____

WEAKNESS ☐ ☐ _____

IRRITATION/REDNESS/BLISTERS ☐ ☐ _____

OTHER FINDINGS:

BASELINE ChE _____

CURRENT ChE _____ DATE/TIME _____

IMPRESSION:

PLAN:

CMA SIGNATURE

DATE _____ CMA STAMP